

热电偶 Thermocouple

热电阻 Thermal resistance

一体化温度变送器 Integrated temperature transmitter

#### 上海谷田自动化仪表有限公司

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# 概述 General

GTAM 是一家专业制造温度传感器和变送器的工厂，是中国工业温度检测仪表的主要供应商之一，我们拥有完整的机械加工和电子产品生产设备，它已经成为了工业温度测量领域的领跑者之一。我们的温度仪表精度高，可靠性好且价格经济，同时我们根据客户的需要提供非标准件产品的定制服务和所有需要的附件。

我们设立了I级检定标准的温度校验室，拥有行业内最高端的检测设备，且通过了国家计量院和上海计量院权威部门的检定认证。

在上海工厂成立了自己的研发中心，与高校、科研所建立了技术合作伙伴关系，聘请多位著名专家指导监督生产，针对任何特殊的测量需要，各种机械结构的传感器、热套管、外壳能够确保仪表即使在恶劣的环境中（如防爆场合、化工厂、发电厂）也能保持最好的性能，从单个的测量点到数百个乃至1000个测量点的大型工厂，都能为客户提供最快速，最优化的解决方案，将用我们在这一领域的丰富经验为您提供最优质的服务。

GTAM始终做品质最好，为客户提供最高质量水准的国际级产品。

GTAM is a company specializing in producing temperature sensors and transmitters and one of the important suppliers of China industrial temperature instruments. With the complete equipment of machining and electronics production, the company has become one of the leaders in the realm of industrial temperature measurement. The company's temperature measuring instruments are precise, reliable and economical. Moreover, the company can provide ordering service of nonstandard products and all necessary accessories according to different demand of users.

The company established a temperature calibration laboratory of grade I calibration standard and has the most high-end measuring equipment in this line, which has passed the calibration certification of such authorities as National Measurement Institute and Shanghai Measurement Institute.

We have set up the temperature check office of Class I inspection standard and possesses top detection equipment among the trade and have passed the inspection and attestation of the authorities like National Measurement Institute and Shanghai Measurement Institute.

The company set up a R&D Center in Shanghai, established technical cooperative partnership with universities and research institutes and invited many famous experts to direct and supervise production. Aimed at special measurement requirements, the sensors, thermal sleeves and casings of various machineries are provided to ensure instruments keep the top performance even in severe environment (such as the environment of anti-explosion requirement, chemical plants and generating plants). The company can provide fast and optimized solution for the factories that have single measuring point or hundreds of even thousands of measuring points. The company will provide you with the high-quality service by the rich experience in this line.

GATM always manufacture the best products and provide users with international -level products of top quality.



铠装电偶电阻线缆  
Sheathed thermocouple and thermal resistance cable



热电偶丝  
Thermocouple wire



防爆接线盒  
Explosion proof connection box



垫片（聚四氟乙烯/紫铜垫）  
Washer (PTFE copper / washer)



保护套管（整体钻孔）  
Protection tube (Whole drill hole)



每只原件均经过检测  
All original elements have been checked.



接线板（高频瓷板及耐高温阻燃树脂板）  
Connecting block (high-frequency vitrolite and temperature-bearing and flame-retarded resin)



过程连接附件  
Procedure linkage accessory



补偿导线、耐高温电线电缆  
Extension wire and high temperature resistant electric wire and cable



过程连接及安装附件  
Procedure linkage and accessory installation



防水式接线盒  
Waterproof type connection box

SHANGHAI GUTIAN AUTOMATION METER CO.,LTD.

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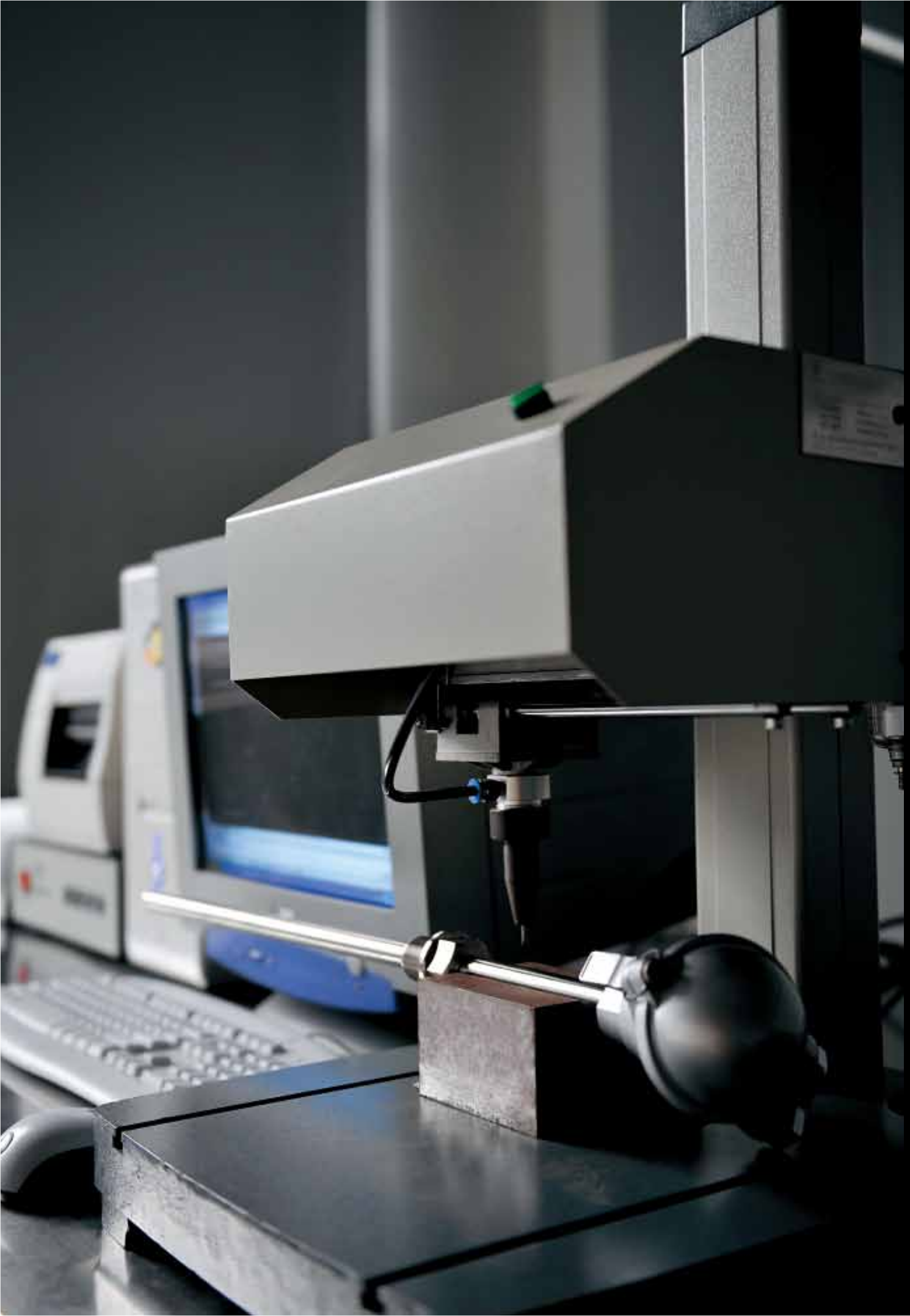
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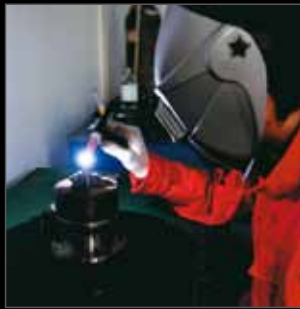
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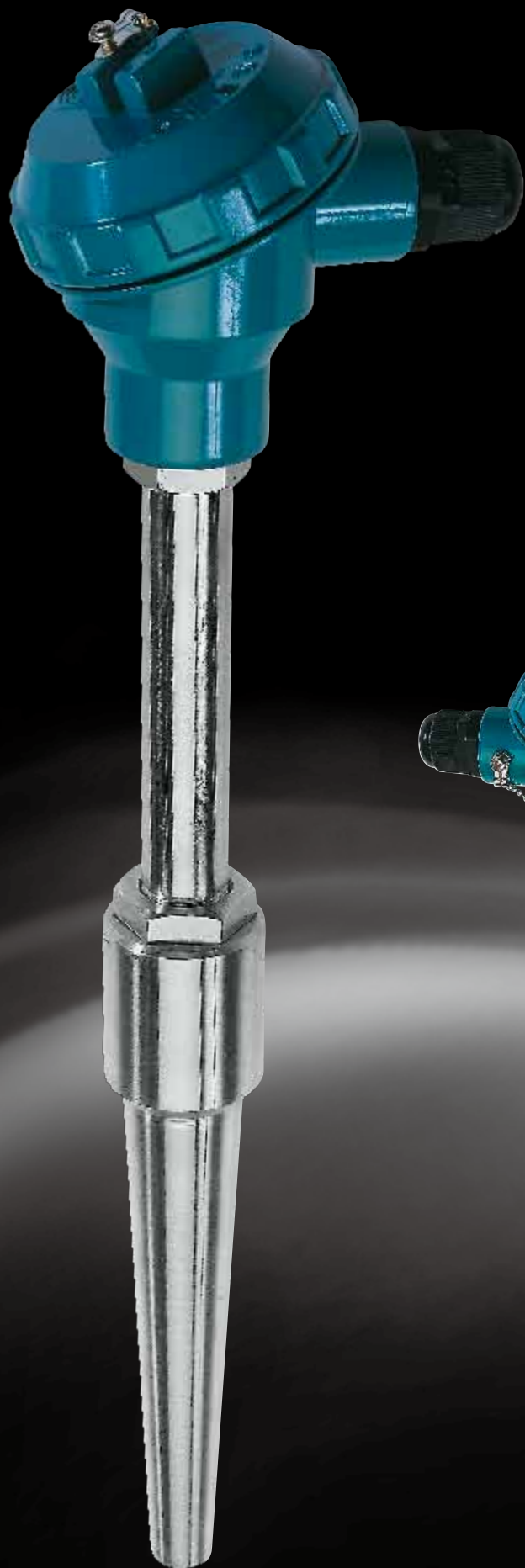






GTAM Expert













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## 装配式热电偶 Assembly Thermocouple



工业用装配式热电偶作为测量温度的传感器，通常和显示仪表、记录仪表、调节器、PLC和DCS系统配套使用。它可以直接测量各种生产过程中从0℃~1800℃范围内的液体、蒸汽和气体介质以及固体的表面温度。

我公司严格根据国家规定，生产符合IEC国际标准分度号的铂铑30—铂铑6、铂铑10—铂、镍铬—镍硅、镍铬硅—镍硅镁、镍铬—铜镍、铜—铜镍、铁—铜镍等形式热电偶，符合JB/T9238-1999标准。

As a sensor for measuring temperature, industrial assembly thermocouple are usually compatible with display instrument, recording instrument, actuator, PLC and DCS system. It can be used to measure the surface temperature of liquid, steam and gas mediums and solid from 0℃-1800℃ during industrial production.

The thermocouples, such as Rhodium Platinum30-Rhodium Platinum6, Rhodium Platinum10-Platinum, Nickel-chromium-nisiloy, Nickel-Chromium-Silicon-Nickel-Chromium-Magnesium, Nickel-Chromium-Cupronickel, Ferrum-cupronickel and Cuprum-cupronickel, produced by our company based on the national stipulation are in accordance with the IEC International Standard Graduation Mark and JB/T9238-1999 Standard.

## 热电偶测温原理 Temperature measurement principle of the thermocouple

热电偶是通过测量其热电势来实现测温的，其两热电极是由两种成份不同的均质导体一端相互连接构成的感温元件。在由两种导体组成的闭合回路中，如果两端点的温度不同，则回路中就会产生一定大小的热电势。其热电势的大小只与导体材料的性质以及两端点的温差有关，同导体的截面积和长度无关。

如下图，选用两种不同的金属或合金丝A、B称为热电极，焊接的一端称为测量端，连接显示仪表的一端称为参比端，当测量端和参比端温度不同时，就会产生热电势 $E_{AB}(t, t_1)$ 。当 $t_1=0℃$ 时则有：

$$E_{AB}(t, 0) = E_{AB}(t) = f(t)$$

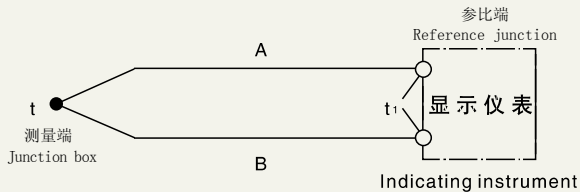
The temperature measuring for thermocouple is achieved through measuring its thermoelectrical potential. Its two thermodes are temperature sensing elements made of equivalent conductors with two different compositions and one connected ends. In the closed loop made of two kinds of conductors, if different temperature arises on the two endpoints, then a certain thermoelectrical potential will be created. The thermoelectrical potential intensity is not related to the sectional area and length of copper conductor but the properties of conductor materials and the temperature of their two endpoints.

Select two different kinds of wire or alloy wire A and B as thermodes, of which, the welded end is referred to as temperature measurement end, the one connected with the indicating instrument is referred to as reference junction. When the temperature of both ends differs from each other, the thermoelectric potential will be brought about.

$$E_{AB}(t, 0) = E_{AB}(t) = f(t)$$

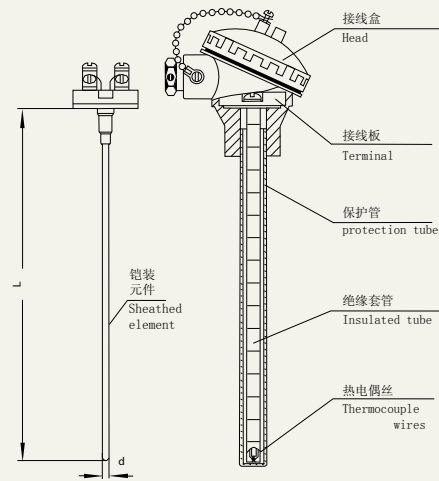


(图1 Fig1)



热电偶测温原理

Temperature measurement principle of the thermocouple



WRK-101

热电偶基本结构

Basic structure of the thermocouple

### 热电偶特性 Characteristic of the thermocouple

热电偶具有测温范围广，热电性能稳定，结构简单，信号可远传，价格低等优点。

The thermocouple has such advantages as wide scope of temperature measurement, stable thermoelectric property, simple structure, signal available for long distance and low price.

根据不同温区和使用环境的要求，须选用不同型号的热电偶材料和保护管。

It is necessary to select thermocouple materials and protection tube of different type in accordance with requirements of different temperature ranges and application environments.

我公司生产的工业热电偶符合JB/T9238—1999《工业热电偶技术条件》，GB/T18404—2001《铠装热电偶电缆及铠装热电偶》（dit. IEC61515:1995），GB/T16839—1997《热电偶分度表及允差》（dit. IEC584—1 and IEC584—2）等标准。

The industrial thermocouples produced by our company comply with some standards such as JB/T9238-1999 Technical Specification of Industrial Thermocouple, GB/T18404-2001 Sheath Thermocouple Cable and Sheath Thermocouple (dit. IEC61515:1995), GB/T16839-1997 Reference Tables and Tolerances of Thermocouple (dit. IEC584-1 and IEC584-2).

### 主要技术指标Key technical indexes

#### 热响应时间 Thermal response time

在温度出现阶跃变化时，热电偶的输出变化至相当于该变化的50%，所需要的时间称为热响应时间，用 $\tau_{0.5}$ 表示。实验介质通常为水。

When the temperature shown step changes, the output variation of the thermocouple shall be at least equivalent to 50% of the variation, and the time that needs is thermal response time, denoted as  $\tau_{0.5}$ . The experimental medium often is water.

#### 热电偶公称压力 Nominal pressure of thermocouple

一般是指在室温情况下保护管所能承受的静态外压而不破损泄漏。实际上，允许工作压力不仅与温度、保护管材料、直径壁厚有关，还与其结构形式、安装方法、置入深度以及被测介质的流速和种类等有关。

It usually indicates the static external pressure the protection tube is capable of bearing under the room temperature while the protection tube does not break. In fact, the safe working pressure is not only related to temperature, materials of protection tube and wall thickness of diameters, but also related to structural configuration, assembling method, placed depth and the flow rate and type of the mediums to be measured.

### 热电偶最小置入深度 Minimum inset depth of thermocouple

应不小于其保护管外径的8~10倍（特殊产品例外）。

The minimum placed depth shall not be less than 8~10 times of the external diameter of its protection tube (excluding special products).

### 热电偶的绝缘电阻（常温）Insulation resistance of thermocouple (normal temperature)

常温绝缘电阻的试验电压为直流500V±50V。测量常温绝缘电阻的大气条件为：温度15~35℃，相对湿度45%~75%，大气压力86~106KPa。

The experimental voltage of insulation resistance at normal temperature is DC 500V±50V. The atmospheric condition for measuring normal-temperature insulation resistance is 15~35℃, while the relative humidity is 45%~75% and the atmospheric pressure is 86~106KPa.

a 对于长度超过1米的热电偶它的常温绝缘电阻与其长度的乘积应≥100MΩ。

既： $R_r \cdot L \geq 100M\Omega \cdot m > 1m$

式中：L—热电偶的长度，m。

a. For the thermocouple longer than 1m, the product of its normal-temperature insulation resistance and length shall not be less than 100 MΩ. That is,  $R_r \cdot L \geq 100M\Omega \cdot m > 1m$ .

Where: L is the length of the thermocouple, m.

b 对于长度等于或不足1米的热电偶，它的常温绝缘电阻值应不小于100MΩ。

b. For the thermocouple not longer than 1m, its normal-temperature insulation resistance shall not be less than 100MΩ.

### 热电偶上限温度绝缘电阻 Insulation resistance at upper limit temperature

测量条件为：被加热的长度为300mm或其总长的50%。试验电压为10±1（V·DC）。

Measuring condition: The heated length shall be 300mm or 50% that of the overall length. The test voltage shall be 10±1（V·DC）.

热电偶的上限温度绝缘电阻应不小于下表规定：

The insulation resistance at upper limit temperature shall not less the specifications shown in the table below:

（表1 Table 1）

上限温度 $t_n$ (℃) Upper limit temperature	试验温度 $t_n$ (℃) Experimental temperature	电阻值 MΩ Resistance value
$100 \leq t_n < 300$	$t = t_n$	10
$300 \leq t_n < 500$	$t = t_n$	2
$500 \leq t_n < 850$	$t = t_n$	0.5
$850 \leq t_n < 1000$	$t = t_n$	0.08
$1000 \leq t_n < 1300$	$t = t_n$	0.02
$t_n > 1300$	$t = 1300$	0.02



热电偶类型、测量范围、等级和允差 Type, measuring range, class and tolerance (GB/T16839.2) (表2 Table 2)

类别 Model	代号 Code	分度号 Graduation Mark	测量范围(℃) Measuring rang	精度 Accuracy	允差△t(℃) Tolerance
铂铑30—铂铑6 Rhodium Platinum30-Rhodium Platinum6	W R R	B	600~1700	2	$\pm 1.5$ 或 $\pm 0.25\%$   t   $\pm 1.5$ 或 $\pm 0.25\%$   t
铂铑10—铂 Rhodium Platinum10-Platinum	W R P	S	0~1600	1	$\pm 1$ 或 $\pm [1+0.3\%(t-1100)]$ ℃ $\pm 1$ 或 $\pm [1+0.3\%(t-1100)]$ ℃
镍铬—镍硅 Nickel-chromium-nisiloy	W R N	K	- 40~+1000	1	$\pm 1.5$ 或 $\pm 0.4\%$   t   $\pm 1.5$ or $\pm 0.4\%$   t
			- 40~+1200	2	$\pm 2.5$ 或 $\pm 0.75\%$   t   $\pm 2.5$ or $\pm 0.75\%$   t
镍铬硅—镍硅镁 Nickel-Chromium-Silicon- Nickel-silicon-magnesium	W R M	N	- 40~+1000	1	$\pm 1.5$ 或 $\pm 0.4\%$   t   $\pm 1.5$ or $\pm 0.4\%$   t
			- 40~+1300	2	$\pm 2.5$ 或 $\pm 0.75\%$   t   $\pm 2.5$ or $\pm 0.75\%$   t
镍铬—铜镍 nickel-chromium-cupronickel	W R E	E	-40~+800	1	$\pm 1.5$ 或 $\pm 0.4\%$   t   $\pm 1.5$ or $\pm 0.4\%$   t
			-40~+900	2	$\pm 2.5$ 或 $\pm 0.75\%$   t   $\pm 2.5$ or $\pm 0.75\%$   t
铁—铜镍 Ferrum-cupronickel	W R J	J	- 40~+750	1	$\pm 1.5$ 或 $\pm 0.4\%$   t   $\pm 1.5$ or $\pm 0.4\%$   t
				2	$\pm 2.5$ 或 $\pm 0.75\%$   t   $\pm 2.5$ or $\pm 0.75\%$   t
铜—铜镍 Cuprum-cupronickel	W R T	T	- 40~+350	1	$\pm 0.5$ 或 $\pm 0.4\%$   t   $\pm 0.5$ or $\pm 0.4\%$   t
				2	$\pm 1$ 或 $\pm 0.75\%$   t   $\pm 1$ or $\pm 0.75\%$   t

注：（1）t为实测温度值。（2）测量范围仅指偶丝。（3）同栏两个允差值中取较大者。  
Note: (1) t is the measured temperature value. (2) The measuring range is used only for thermocouple wires. (3) Of the two tolerance values in the same column, the larger one shall be used.

金属保护管材料 Metal protection tube material

(表3 Table 3)

代号 Code	材料种类 (牌号/代号) Material type (Brand/Code)		使用最高温度 (°C) Maximum application temperature (°C)		特性 Characteristics
	中国 (GB) (GB) China	美国 (ASTM) (ASTM) USA	长期 Long-term	短期 Short-term	
S4	0Cr18Ni9	304	850	900	铬镍合金: 耐热钢, 耐酸、耐碱。不适用于硫磺、还原性气氛。 Chrome-nickel alloy; heat-resisting steel, acid proof and alkali proof. Not suitable for sulfur and reducing gas.
L4	00Cr19Ni10	304L	800	900	铬镍合金: 是304的超低碳钢, 由于含碳量低, 耐晶间腐蚀性优越。 Chrome-nickel alloy; 304 ultra-low-carbon steel with low carbon content and fine inter-crystalline corrosion resistance.
C5	0Cr25Ni20	310S	1000	1150	高铬镍合金: 耐热性好, 具有良好的抗氧化、抗渗碳性能和机械性能。 High-chrome-nickel alloy with good heat-resistance and fine anti-oxidation, anti-carburization and mechanical property.
S6	0Cr17Ni12Mo2	316	800	900	铬镍合金: 高温中的耐腐蚀性能好, 耐酸、碱、海水与侵蚀性物质。 Chrome-nickel alloy with good corrosion proof in high temperature and acid proof, alkali proof and seawater proof properties.
L6	00Cr17Ni14Mo2	316L	800	900	铬镍合金: 超低碳钢, 耐晶间腐蚀好, 抗氧化物。其余性能同316相似。 Chrome-nickel alloy; ultra-low-carbon steel with fine inter-crystalline corrosion resistance and anti-oxidation properties. Other properties are same as that of 316.
MT	00Cr18Ni12Mo2Ti	316Ti	800	900	铬镍合金: 耐晶间腐蚀和点蚀的性能优良。耐尿素、稀硫酸等各种有机酸。 Chrome-nickel alloy with fine inter-crystalline corrosion resistance and pitting corrosion and good organic acid proof properties, such as carbamide and dilute sulphuric acid.
S9	1Cr18Ni9Ti	321	800	900	铬镍合金: 抗氧化性能良好。对磷酸和稀硝酸和醋酸具有良好的耐蚀性。 Chrome-nickel alloy with fine anti-oxidation and good organic acid proof properties, such as phosphoric acid and dilute nitric acid.
Nb	0Cr18Ni11Nb	347	750	870	铬镍合金: 高温强度好, 耐晶间应力腐蚀性良好。耐酸、碱、盐等介质。 Chrome-nickel alloy with fine inter-crystalline corrosion resistance in high temperature and good medium proof properties, such as acid, alkali and salt.
N6	1Cr15Ni75Fe8	Inconel600	1050	1250	镍铬铁合金: 最适合高温氧化, 还原性气氛。抗氯离子应力腐蚀能好。 Nickel-chromium-iron alloy; especially suitable for high temperature oxidation and reducing gas with good anti-chlorion stress corrosion property.
IN8	0Cr20Ni32AlTi	Inconel800	1100	1100	高镍铁合金: 耐硫、氧化物和熔融的中性盐, 耐二氧化碳的混合气体。 High chromium-iron alloy with good sulfide, cyanide and fusing neutral salt proof and fine mixed gas of carbon dioxide proof properties.
HB	0Ni65Mo28Fe5V	Hastelloy B	500	800	镍铁钼合金: 在沸点下一切浓度和盐酸都有良好的耐蚀性, 耐酸、氢氟酸。 Ferro-nickel-molybdenum alloy with good acid corrosion proof property for hydrochloric acid and hydrofluoric acid.
HC	0Cr15Ni60Mo16W5Fe5	Hastelloy C	1000	1090	镍铬铁钼合金: 耐氧化性硝酸等、高于常温的次氯酸盐溶液等的腐蚀。 Nickel-chromium-iron alloy with good hypochloric acid solution corrosion proof property above the normal temperature, such as oxidized nitric acid.
5M	Ni70Cu28	Monel K500	150	200	镍铜合金: 耐氢氟酸、硫酸、盐酸、抗海水和大多数碱性物质性能优异。 Nickel-copper alloy with fine acid proof, alkali proof and seawater proof properties, such as hydrofluoric acid, sulfuric acid, hydrochloric acid and most alkaline matters.
Ni	Ni9990	Nickel 201	150	200	耐浓碱 (纯碱、烧碱) 腐蚀特别优异, 中性和微酸性溶液以及有机溶剂。 With special fine concentrated base proof (soda and sodium hydroxide), neutral solution, sub-acid solution and organic solvent proof properties.
Ti	TA(1~3)	Grade(1~3)	150	200	耐湿氯气, 浓硝酸。对抗含Co2的海水、海生物、海洋大气的腐蚀。 With fine wet chlorine gas, aquafortis proof and anti-seawater with Co2, marine growth and marine atmosphere prosperities.
G3	GH3030	—	1050	1125	镍基高温合金: 高温下具有良好的力学性能、抗氧化和抗热腐蚀性能。 Ni-base superalloy with fine mechanical property, oxidation resistance and anti-hot corrosion in high temperature.
G9	GH3039	—	1100	1200	镍基高温合金: 高温下抗氧化能力强、足够的持久强度和冷热疲劳性能。 Ni-base superalloy with fine oxidation resistance and long time strength and thermal fatigue behavior.



非金属保护管材料 Material of nonmetal protection tube

(表4 table 4)

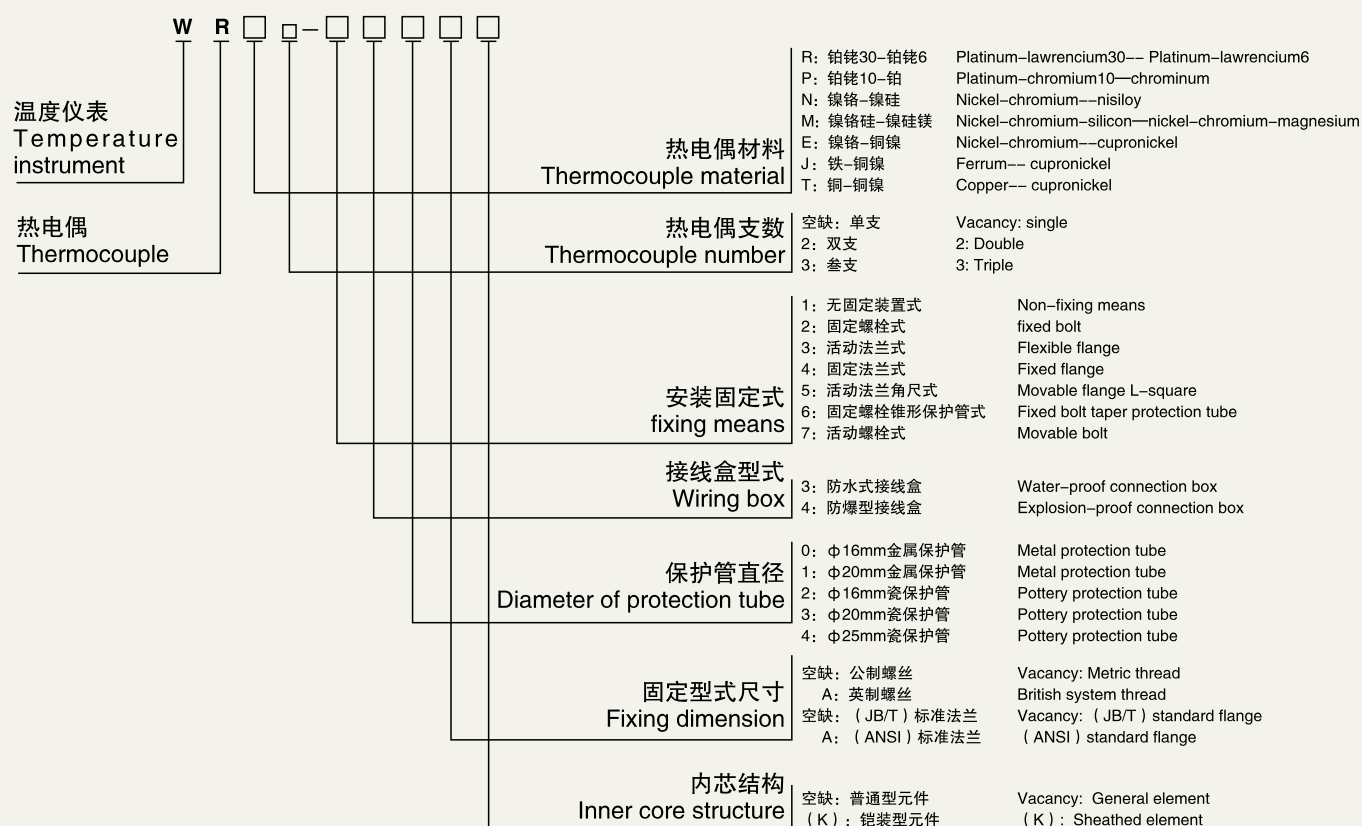
代号 Code	材料种类 (成份/代号) Type of material (constitution/symbol)	使用最高温度 (℃) Highest application temperature (℃)		特性 Characteristics
		长期 Long term	短期 Short term	
S0	石英 (SiO <sub>2</sub> ) Quartz	1000	1100	耐高温、膨胀系数低, 耐热震性、化学稳定性和电绝缘性能好, 急冷, 急热强度差。 high temperature resistant, lower coefficient of expansion, good chemical stability and electric insulativity, poor rapid cooling and heating strength.
F4	聚四氟乙烯 (PIFE) Polytetrafluoroethylene	250	280	具有优异的化学稳定性和力学强度, 广泛适用于各种腐蚀介质的温度测量。 excellent chemical stability and mechanical strength, widely applicable to measuring temperatures for corrosive mediums.
F46	聚全氟乙丙烯 (FEP) Fluorinated Ethylene Propylene	200	230	具有F4优良的耐腐蚀化学稳定性, 冲击性能特好, 成型好, 熔融粘接好。 excellent corrosion-proof chemical stability of F4, good impact property, good formability and fine molten adhesion.
A8	高铝质 (85%~90%A12O <sub>3</sub> ) High aluminum texture	1500	1600	有耐高温剧变性能。气密性好, 化学性稳定, 高温下绝缘良好。急冷, 急热强度差。 resistant to high-temperature change, good airtightness, stable chemistry, fine insulation under high temperature, poor rapid cooling and heating strength.
A9	刚玉质 (99%A12O <sub>3</sub> ) Corundum texture	1600	1700	有耐高温剧变性能。气密性良好, 化学性稳定, 高温下绝缘良好。急冷, 急热强度差。 resistant to high-temperature change, good airtightness, stable chemistry, fine insulation under high temperature, poor rapid cooling and heating strength.
SN	氮化硅 (Si <sub>3</sub> N <sub>4</sub> ) Silicon nitride	1000	1100	在高温下具有较好的抗铝液的冲刷能力, 机械性能好, 适用于铝液的温度测量。 good anti-scour to aluminium pad under high temperature, good mechanical properties, applicable to measuring the temperature of aluminium pad.
SC	碳化硅 (99%SiC) Silicon carbide	1600	1650	耐火度和硬度很高。导热性、热膨胀、耐压性以及导电性等方面具有优势。 high refractoriness and hardness, dominant heat conductivity, thermal expansion, pressure resistance and conductivity.
MS	二硅化钼 (MoSi <sub>2</sub> ) Molybdenum disilicide	1600	1700	高温抗氧化性优良。抗腐蚀性、热稳定性、气密性良好。具有耐高温剧变的性能。 fine antioxygenic property under high temperature, good corrosion resistance, thermal stability and airtightness, resistant to high-temperature change.

陶瓷保护管直径和长度规格 Diameter and length specification of porcelain protection tube

(表5 table 5)

直径 Diameter	长度规格L×l Length specification									
Φ16 (单套管) Single shell-tube	总长度 L Total length	300	350	400	450	550	650	900	1150	1650
	插入长度 l Insertion length	150	200	250	300	400	500	750	1000	1500
Φ20 (单套管) Single shell-tube	总长度 L Total length	—	—	400	450	550	650	900	1150	1650
	插入长度 l Insertion length	—	—	250	300	400	500	750	1000	1500
Φ25 (双层套管) Double shell-tube	总长度 L Total length	—	—	—	—	550	650	900	1150	1650
	插入长度 l Insertion length	—	—	—	—	400	500	750	1000	1500

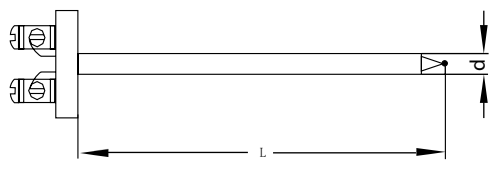
## 型号命名Type designation



简易式铂铑热电偶Simple type platinum-rhodium thermocouple Simple Type PtRh TC

(图2 Fig 2)

型号 Model	分度号 Graduation Mark	测量范围 ( $^{\circ}\text{C}$ ) Measuring Range ( $^{\circ}\text{C}$ )	热相应时间 $\tau 0.5(\text{s})$ Thermal Response Time $\tau 0.5(\text{s})$	保护管材料 Protection Tube Material	规格 (mm) Specification	
					d	L
WRR-010 WRR <sub>2</sub> -010	B	0~1600	$\leq 2$	刚玉质 Corundum	$\phi 8$	320 670 370 920 420 1170 470 1670 520 2170 570
WRP-010 WRP <sub>2</sub> -010	S	0~1300				

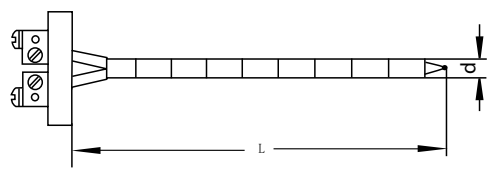


注: 贵金属热电偶丝直径为:  $\phi 0.5\text{mm}$ 。Note: The diameter of noble metal thermocouple wires is  $\phi 0.5\text{mm}$ .

简易式热电偶(普通型) Simple type thermocouple (conventional type)

(图3 Fig 3)

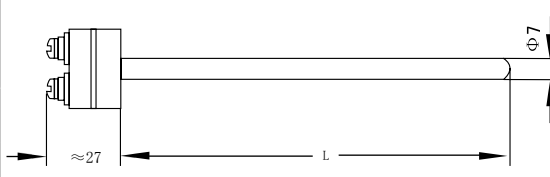
型号 Model	分度号 Graduation Mark	测量范围 ( $^{\circ}\text{C}$ ) Measuring Range ( $^{\circ}\text{C}$ )	热相应时间 $\tau 0.5(\text{s})$ Thermal Response Time $\tau 0.5(\text{s})$	保护管材料 Protection Tube Material	规格 (mm) Specification	
					L	
WRN-010 WRN <sub>2</sub> -010	K	0~1000	$\leq 2 \sim \leq 5$	高铝质 High Al <sub>2</sub> O <sub>3</sub>		320 670 370 920 420 1170 470 1670 520 2170 570
WRE-010 WRE <sub>2</sub> -010	E	0~600				



注: 廉金属热电偶丝直径为:  $\phi 1.2\text{mm} \sim 3.2\text{mm}$ 。Note: The diameter of base metal thermocouple is  $\phi 1.2\text{mm} \sim 3.2\text{mm}$ .

小型铂铑热电偶Small-sized platinum-rhodium thermocouple

(图4 Fig 4)

型号 Model	分度号 Graduation Mark	测量范围 (℃) Measuring Range (℃)	热相应时间 $\tau$ 0.5 (s) Thermal Response Time $\tau$ 0.5 (s)	保护管材料 Protection Tube Material	L (mm)	
WRR-100	B	0~1600	$\leq 45$	刚玉质 Corundum	225	
WRP-100	S	0~1300		高铝质 High Al2O3		


注：贵金属热电偶丝直径为：Φ0.5mm。

Note: The diameter of noble metal thermocouple is Φ0.5mm.

无固定装置式热电偶（瓷保护管）Non-fixed device thermocouple ( ceramic protection tube)

(图5 Fig 5)

热电偶类别 Category	产品型号 Model	分度号 Graduation Mark	测温范围 Measuring Range ℃	规格Specification		热响应时间 Thermal Response Time $\tau$ 0.5 (s)
				直径 Diameter mm	保护管材料 Protection tube material	
单支铂铑30-铂铑6 Single rhodium platinum 30- rhodium platinum 6	WRR-130	B (LL-2)*	0~1600	Φ16	刚玉质 Corundum	$\leq 120$
	WRR-131			Φ25		$\leq 240$
双支铂铑30-铂铑6 Twin rhodium platinum 30- rhodium platinum 6	WRR <sub>2</sub> -130			Φ16		$\leq 120$
	WRR <sub>2</sub> -131			Φ25		$\leq 240$
单支铂铑10-铂 Single rhodium platinum 10-platinum	WRP-130	S (LB-3)*	0~1300	Φ16	高铝质 High Al2O3	$\leq 120$
	WRP-131			Φ25		$\leq 240$
双支铂铑10-铂 Twin rhodium platinum 10-Platinum	WRP <sub>2</sub> -130			Φ16		$\leq 120$
	WRP <sub>2</sub> -131			Φ25		$\leq 240$
单支镍铬-镍硅 Single nickel- chromium-nisiloy	WRN-132	K (EU-2)*	0~1100	Φ16	高铝质High Al2O3	$\leq 120$
	WRN-133		0~1200	Φ20		$\leq 160$
双支镍铬-镍硅 Twin nickel- chromium-nisiloy	WRN <sub>2</sub> -132		0~1100	Φ16		$\leq 120$
	WRN <sub>2</sub> -133		0~1200	Φ20		$\leq 160$



注：（1）长度规格参见6页，表5；非置入部分为20#碳钢、或不锈钢材料。

（2）直径Φ25mm为双层瓷套管。

（3）打“\*”分度号作特殊规格订货。

Note: (1) Refer to Page 6, Table 5 for length specification. Non-placed part is of carbon steel 20# or stainless steel.

(2) Diameter Φ25mm is of two-layer porcelain bushing.

(3) That of “\*” is the order of special specification.



无固定装置式热电偶 (金属保护管) Non-fixed device thermocouple( metal protection tube)

(图6 Fig 6)

热电偶类别Category	产品型号 Model	分度号 Graduation Mark	测温范围 Measuring Range ℃	保护管材料 Protection tube material	规格Specification	
					总长 Overall length Lmm	
单支镍铬-镍硅 Single nickel-chromium-nisiloy	WRN-130	K (EU-2) *	0~800	1Cr18Ni9Ti	250	
双支镍铬-镍硅 Twin nickel-chromium-nisiloy	WRN <sub>2</sub> -130		0~1000	0Cr25Ni20	300	
单支镍铬-铜镍 Single nickel-chromium-cupronickel	WRE-130	E (EA-2)*	0~600	1Cr18Ni9Ti	350	
双支镍铬-铜镍 Twin nickel-chromium-cupronickel	WRE <sub>2</sub> -130				400	
单支镍铬硅-镍硅镁 Single nickel-chromium-silicon-nickel-silicon-magnesium	WRM-130	N	0~800	1Cr18Ni9Ti	450	
	双支镍铬硅-镍硅镁 Twin nickel-chromium-silicon-nickel-silicon-magnesium				WRM <sub>2</sub> -130	
单支铁-铜镍 Single ferrum-cupronickel	WRJ-130	J	0~500	1Cr18Ni9Ti	650	
	双支铁-铜镍 Twin ferrum-cupronickel				WRJ <sub>2</sub> -130	
单支铜-铜镍 Single cuprum-cupronickel	WRT-130	T	-40~+350		1150	
双支铜-铜镍 Twin cuprum-cupronickel	WRT <sub>2</sub> -130				1650	
				2150		

注: (1) 热响应时间  $\tau$  0.5<90s。

(2) 保护管材料参见5页, 表3。

(3) 打“\*”分度号作特殊规格订货。

(4) 保护管选用0Cr25Ni20, 型号后面加“H”, 例: WRN-130H。

Note: (1) Thermal Response Time  $\tau$  0.5(s) is less than 90s.

(2) Refer to page 5, table 3 for protection tube material.

(3) That of “\*” is the order of special specification.

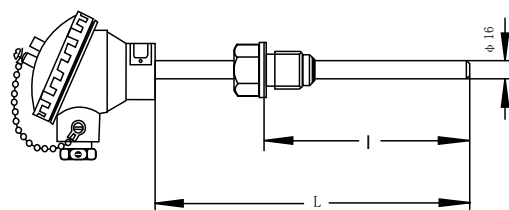
(4) The protection tube shall use 0Cr25Ni20, and be remarked a “H” be hind the model, for example WRN-130H.

# 固定螺栓式热电偶 Fixed bolt thermocouple

(图7 Fig 7)

热电偶类别Category	产品型号 Model	分度号 Graduation Mark	测量范围 (℃) Measuring Range (℃)	热响应时间 τ 0.5(s) Thermal Response Time τ 0.5(s)	保护管材料 Protection Tube Material	规格 Specification	
						L×I	
单支铂铑30—铂铑6 Single rhodium platinum 30-rhodium platinum 6	WRR-230 WRR <sub>2</sub> -230	B	0~1600	≤120	钢玉质 Corundum	250×100	
双支铂铑30—铂铑6 Twin rhodium platinum 30- rhodium platinum 6						300×150	
单支铂铑10—铂 Single rhodium platinum 10- platinum	WRP-230 WRP <sub>2</sub> -230	S	0~1300		350×200		
双支铂铑10—铂 Single rhodium platinum 10- platinum							
单支镍铬—镍硅 Single nickel-chromium- nisiloy	WRN-232 WRN <sub>2</sub> -232	K	0~1100	≤90	高铝质 High Al2O3 Ceramic	400×250	
双支镍铬—镍硅 Twin nickel-chromium- nisiloy							
单支镍铬—镍硅 Single nickel-chromium- nisiloy	WRN-233 WRN <sub>2</sub> -233						
双支镍铬—镍硅 Twin nickel-chromium- nisiloy							
单支镍铬硅—镍硅镁 Single nickel-chromium- silicon- nickel-silicon- magnesium	WRM-232 WRM <sub>2</sub> -232	N	0~1200				
双支镍铬硅—镍硅镁 Twin nickel-chromium- silicon- nickel-silicon- magnesium							
单支镍铬硅—镍硅镁 Single nickel-chromium- silicon- nickel-silicon- magnesium	WRM-233 WRM <sub>2</sub> -233						
双支镍铬硅—镍硅镁 Twin nickel-chromium- silicon- nickel-silicon- magnesium							
单支镍铬—镍硅 Single nickel-chromium- nisiloy	WRN-230 WRN <sub>2</sub> -230	K (EU-2)*	0~1000			1Cr18Ni9Ti 0Cr25Ni20	1150×1000
双支镍铬—镍硅 Twin nickel-chromium- nisiloy							
单支镍铬—铜镍 Single nickel-chromium- cupronickel	WRE-230 WRE <sub>2</sub> -230	E (EA-2)*	0~600			1Cr18Ni9Ti	1650×1500
双支镍铬—铜镍 Twin nickel-chromium- cupronickel							

The diagram illustrates a thermocouple assembly. It features a protective tube with a threaded end and a flange. A thermocouple wire is inserted into the tube. The length of the tube is labeled 'L', and the length of the thermocouple wire is labeled 'I'. The diameter of the tube is indicated as 'φ 16'.

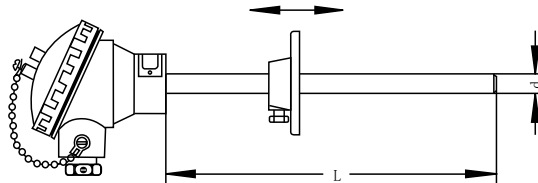


- 注： (1) 保护管材料参见5页，表3；6页，表4。  
 (2) 打“\*”分度号作特殊规格订货。  
 (3) 公称压力：10MPa。  
 (4) 型号后加(K)，内芯元件为铠装元件。例：WRN-230(K)。  
 (5) 固定螺栓规格参见91页，图147。

- Note: (1) Refer to page 5, table 3 and page 6, table 4 for protection tube material.  
 (2) That of “\*” is the order of special specification.  
 (3) Nominal pressure is 10MPa.  
 (4) Model with suffix (K), its inner core is sheathed element. For example WRN-230 (K).  
 (5) Refer to Page 91, Fig 147 for the specification of fired bolt.

活动法兰式热电偶 Flexible flange thermocouple

(图8 Fig 8)

热电偶类别Category	产品型号 Model	分度号 Graduation Mark	测量范围 (℃) Measuring Range (℃)	热响应时间 τ 0.5(s) Thermal Response Time τ 0.5(s)	规格specification		
					L		
单支铂铑30—铂铑 6 Single rhodium platinum 30- rhodium platinum 6	WRR-330 WRR <sub>2</sub> -330	B	0~1600	≤120	250		
双支铂铑30—铂铑 6 Twin rhodium platinum 30- rhodium platinum 6							
单支铂铑10—铂 Single rhodium platinum 10- platinum	WRP-330 WRP <sub>2</sub> -330	S	0~1300				300
双支铂铑10—铂 Single rhodium platinum 10-platinum							
单支镍铬—镍硅 Single nickel-chromium- nisiloy	WRN-332 WRN <sub>2</sub> -332	K	0~1100	≤90	350		
双支镍铬—镍硅 Twin nickel-chromium- nisiloy					400		
单支镍铬—镍硅 Single nickel-chromium- nisiloy	WRN-333 WRN <sub>2</sub> -333				450		
双支镍铬—镍硅 Twin nickel-chromium- nisiloy					550		
单支镍铬硅—镍硅镁 Single nickel-chromium- silicon- nickel-silicon- magnesium	WRM-332 WRM <sub>2</sub> -332	N	0~1200	650			
双支镍铬硅—镍硅镁 Twin nickel-chromium- silicon- nickel-silicon- magnesium				750			
单支镍铬硅—镍硅镁 Single nickel-chromium- silicon- nickel-silicon- magnesium	WRM-333 WRM <sub>2</sub> -333			900			
双支镍铬硅—镍硅镁 Twin nickel-chromium- silicon- nickel-silicon- magnesium				1150			
单支镍铬—镍硅 Single nickel-chromium- nisiloy	WRN-330	K (EU-2)*	0~1000	1650			
双支镍铬—镍硅 Twin nickel-chromium- nisiloy	WRN <sub>2</sub> -330			2150			
单支镍铬—铜镍 Single nickel-chromium- cupronickel	WRE-330	E (EA-2)*	0~600				
双支镍铬—铜镍 Twin nickel-chromium- cupronickel	WRE <sub>2</sub> -330						

- 注： (1) 保护管材料参见5页，表3；6页，表4。  
 (2) 打“\*”分度号作特殊规格订货。  
 (3) 活动法兰规格参见92页，图151。  
 (4) 型号后加(K)，内芯为铠装元件。例：WRN-330(K)。

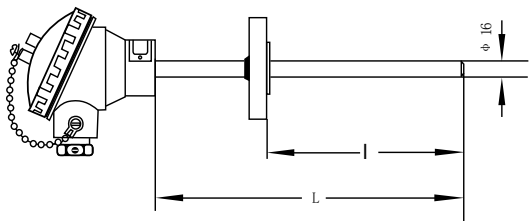
- Note: (1) Refer to page 5, table 3 and page 6, table 4 for protection tube material.  
 (2) That of “\*” is the order of special specification.  
 (3) Refer to Page 92 Fig 151 for the specification of movable flange.  
 (4) Model with suffix (K), its inner core is sheathed element. For example WRN-330 (K).



# 固定法兰式热电偶Fixed flange thermocouple

(图9 Fig 9)

热电偶类别Category	产品型号 Model	分度号 Graduation Mark	测量范围 (℃) Measuring Range (℃)	热响应时间 τ 0.5 (s) Thermal Response Time τ 0.5 (s)	保护管材料 Protection Tube Material	规格 Specification
						L ×I
单支镍铬—镍硅 Single nickel-chromium- nisiloy	WRN-430 WRN <sub>2</sub> -430	K	0~800	≤90	1Cr18Ni9Ti	250×100
双支镍铬—镍硅 Twin nickel-chromium- nisiloy			0~1000		0Cr25Ni20	300×150
单支镍铬硅—镍硅镁 Single nickel-chromium- nickel-silicon-magnesium	WRM-430 WRM <sub>2</sub> -430	N	0~800		1Cr18Ni9Ti	350×200
双支镍铬硅—镍硅镁 Twin nickel-chromium- silicom-nickel-silicon- magnesium			0~1000		0Cr25Ni20	400×250
单支镍铬—铜镍 Single nickel-chromium- cupronickel	WRE-430 WRE <sub>2</sub> -332	E	0~600		1Cr18Ni9Ti	450×300
双支镍铬—铜镍 Twin nickel-chromium- cupronickel			550×400			
单支铁—铜镍 Single ferrum-cupronickel	WRJ-430 WEJ <sub>2</sub> -430	J	0~500			650×500
双支铁—铜镍 Twin ferrum-cupronickel			900×750			
单支铜—铜镍 Single cuprum- cupronickel	WRT-430 WRT <sub>2</sub> -430	T	- 40~ + 350			1150×1000
双支铜—铜镍 Twin cuprum-cupronickel						1650× 1500
						2150× 2000



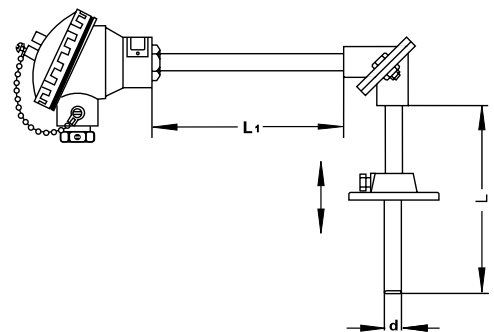
注：（1）公称压力：2.5MPa。（2）型号后加（K），内芯为铠装元件。例：WRN-430（K）。（3）法兰规格参见92页，图150。

Note: (1) Normal pressure: 2.5MPa. (2) Model with suffix (K), its inner core is sheathed element. For example WRN-430 (K). (3) See Page 92, Fig 150 for the specification of flexible flange.

# 活动法兰角尺式热电偶Flexible flange L-square thermocouple

(图10 Fig 10)

热电偶类别Category	产品型号Model	分度号Graduation Mark	测量范围(°C)Measuring Range (°C)	热响应时间 $\tau$ 0.5(s)Thermal Response Time $\tau$ 0.5(s)	保护管材料Protection Tube Material	规格Specification	
						d	L × I
单支镍铬-镍硅 Single nickel-chromium-nisiloy	WRN-530 WRN <sub>2</sub> -530	K	0~800	≤90	1Cr18Ni9Ti 0Cr25Ni20	Φ 16	500×500
双支镍铬-镍硅 Twin nickel-chromium-nisiloy			0~1000				
单支镍铬硅-镍硅镁 Single nickel-chromium-nickel-silicon-magnesium	WRM-530 WRM <sub>2</sub> -530	N	0~800				
双支镍铬硅-镍硅镁 Twin nickel-chromium-nickel-silicon-magnesium			0~1000				
单支镍铬-铜镍 Single nickel-chromium-cupronickel	WRE-530 WRE <sub>2</sub> -530	E	0~600				
双支镍铬-铜镍 Twin nickel-chromium-cupronickel			0~600				
单支铂铑10-铂 Single Rhodium Platinum 10-Platinum	WRP-530	S	0~1300	≤120	刚玉质	Φ 20	1000×500
双支铂铑10-铂 Twin Rhodium Platinum 10-Platinum	WRP <sub>2</sub> -530	S					

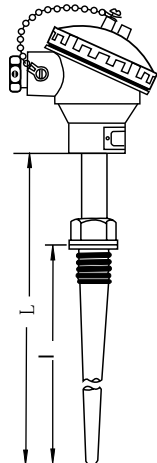


注：（1）公称压力为常压。（2）型号后加（K）内芯为铠装元件。例：WRN-530（K）。（3）活动法兰规格参见92页，图151。

Note: Nominal pressure is ordinary pressure. (2) Model with suffix (K), its inner core is sheathed element. For example WRN-530 (K). (3) See Page 92, Fig 151 for the specification of flexible flange.

固定螺栓锥形保护管热电偶Fixed bolt taper protection tube thermocouple

(图11 Fig 11)

热电偶类别Category	产品型号 Model	分度号 Graduation Mark	测量范围 (℃) Measuring Range (℃)	热响应时间 τ 0.5(s) Thermal Response Time τ 0.5 (s)	保护管材料 Protection Tube Material	规格Specification	
						L ×I	
单支镍铬-镍硅 Single nickel- chromium-nisiloy 双支镍铬-镍硅 nickel-chromium- nisiloy	WRN-630 (K) WRN <sub>2</sub> -630 (K)	K	0~600	≤45	1Cr18Ni9Ti	225×75	
	WRN-630A (K) WRN <sub>2</sub> -630A (K)					250×100	
	WRN-630B (K) WRN <sub>2</sub> -630B (K)					300×150	
单支镍铬-铜镍 Single nickel- chromium- cupronickel 双支镍铬-铜镍 Twin nickel- chromium- cupronickel	WRE-630 (K) WRE <sub>2</sub> -630 (K)	E	0~600			350×200	
	WRE-630A (K) WRE <sub>2</sub> -630A (K)					400×250	
	WRE-630B (K) WRE <sub>2</sub> -630B (K)					450×300	
				500×350			
				550×400			
				600×450			
				650×500			

注：（1）公称压力：30MPa。流速≤80m/s  
 （2）选用英制G1”螺栓，内芯铠装元件，应在型号后加A。例如：WRN-630A(K)  
 （3）选配齿形垫片，应在型号后加B，例如：WRN-630B(K)。齿形垫片参见93页，图152。

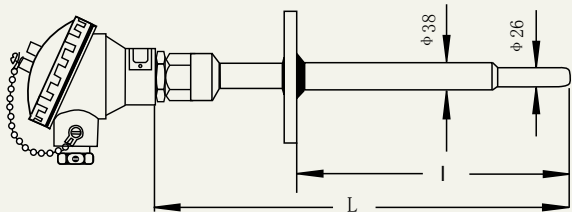
Note: （1）Normal pressure:30MPa. Flow rate≤80m/s.  
 （2）“A” shall be attached to the model if British system G1” bolt and sheat elements for inner core is selected for use, for example: WRN-630A(K).  
 （3）When serrated washer is used,B should be added after model, for example: WRN-630B(K). Refer to page 93, Fig 152 for specification of serrated waster.

### 拱顶热电偶Dome thermocouple

WRP型拱顶热电偶是为了适应高炉拱顶温度的检测，而进行设计制造的新型热电偶。热电偶保护管选用进口Sic再结晶材料能够满足高炉测温的特殊要求。在构造上，有密封、耐震动、可以垂直安装和有快速装卸的法兰结构。

WRP-type dome thermocouple is a new thermocouple designed and manufactured to be adapted to measuring the temperature of the dome of blast furnace. The thermocouple protection tube, made of imported Sic recrystallized material can meet the special requirements that are needed to measure the temperature of blast furnace. For the structure, it has a flange structure which is sealed, and quake-resistant and can be installed vertically and assembled or disassembled quickly.

(图12 Fig 12)



## 主要技术指标Major technical indexes

分度号: S (铂铑10—铂) Graduation symbol: S (platinum rhodium 10—platinum)

测温范围: 0~1300℃ Measuring range: 0~1300℃

公称压力: 0.3MPa Nominal pressure: 0.3MPa

热响应时间:  $\tau$  0.5<360S Thermal response time:  $\tau$  0.5<360S

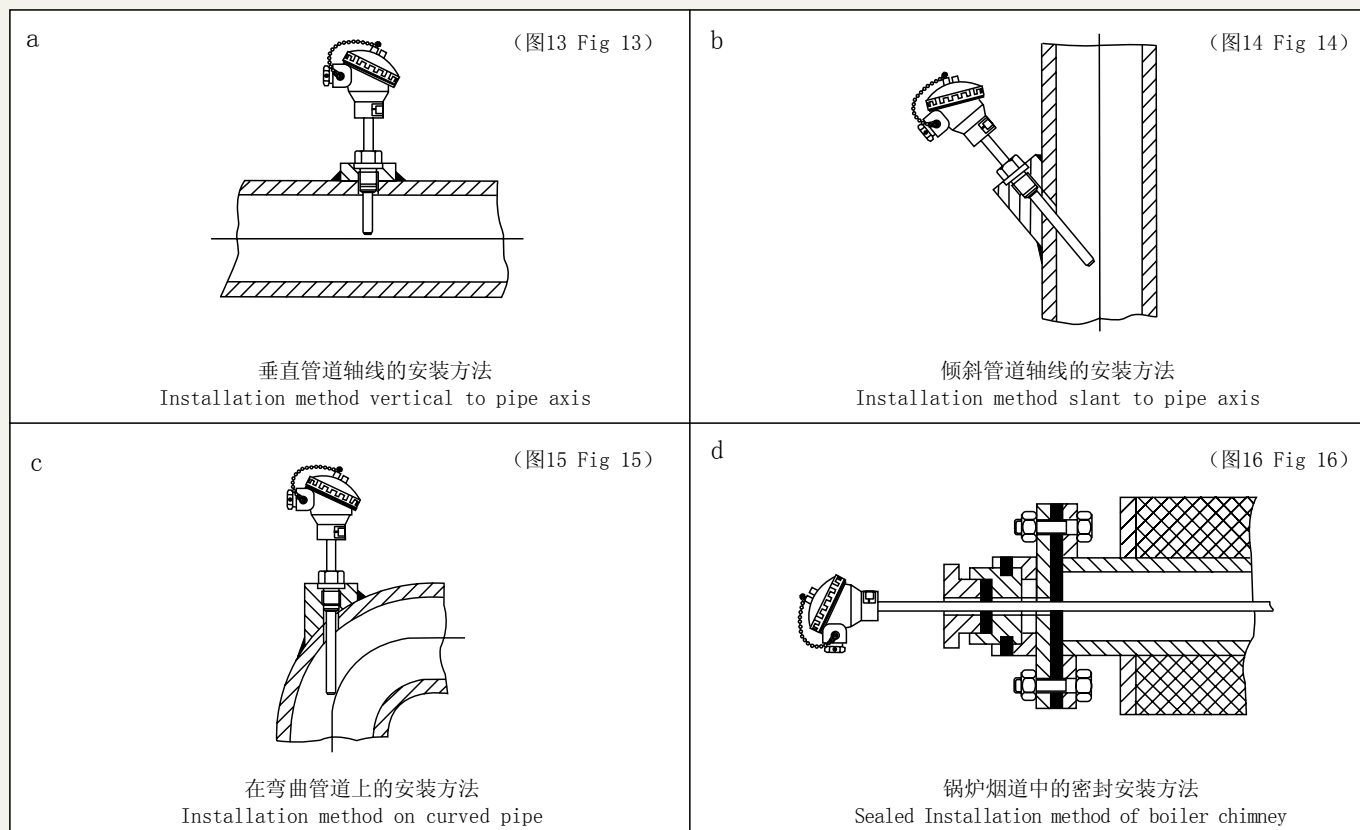
允许误差 $\Delta t$ :  $\pm 1.5^\circ\text{C}$  或  $0.75\%t$  Permissible error  $\Delta t$ :  $\pm 1.5^\circ\text{C}$  or  $0.75\%t$ .

规格长度L×I: 1400×1250、1750×1600mm

Length L×I: 1400×1250, 1750×1600mm

## 装配式热电偶 热电阻安装示意图

### Scheme of installation of Assebmly thermocouple and thermal resistance





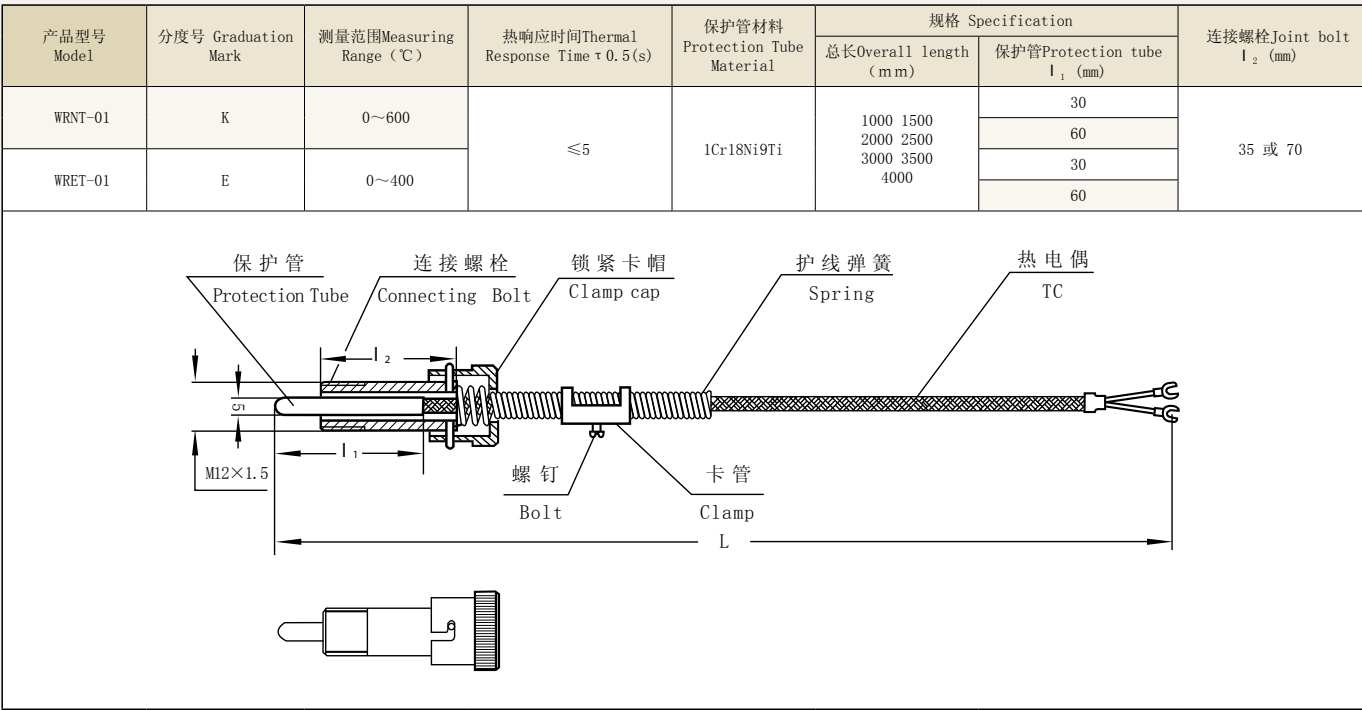
压簧固定式热电偶 Pressing spring fixed thermocouple

压簧固定式热电偶通过压簧将热电偶测量端与被测物表面紧贴，以提高测量的可靠性和准确性。与显示仪表等配套使用，可直接测量0~600℃范围内的温度。该热电偶为软性导线，可以自由弯曲，具有热响应时间短，使用方便等特点，适用于塑料挤出机、轻纺、食品等工业。

Press spring fixed thermocouple has the measuring end clung to the surface of the objects to be measured through a pressing spring, improving the reliability and accuracy. Matching with the indicating instruments, it can directly measure the temperature within 0~600℃. Provided with soft wire, the thermocouple can be bent freely, and has advantages of short thermal response time and convenience.

型号规格Type Specificatin

(图17 Fig 17)



订货须写明：  
（1）产品名称和型号。（2）总长和置入深度（ $L \times l_1 \times l_2$ ）。（3） $l_1=90$ 、 $l_2=70$ 为特殊订货。  
The order shall be marked:  
（1）The name and model of the product. （2）The overall length and placed depth（ $L \times l_1 \times l_2$ ）. （3）Those of  $l_1=90$ 、 $l_2=70$  are special ones.

# 软性热电偶Soft thermocouple

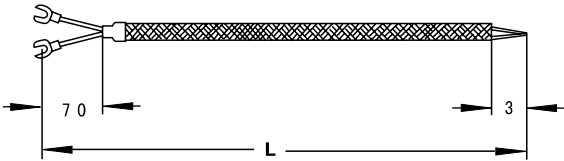
由于软性热电偶的绝缘层和保护层均为非金属的耐高温材料，具有任意弯曲、缠绕、不畏震动、安装方便、使用灵活的特点，因此在某些特定场合的使用中优于铠装热电偶，主要应用于航空、航天、机械等工业炉窑及热处理，钢厂、铝厂、玻璃、陶瓷和建材生产的温度测量和控制。

Due to the non-metallic high temperature material, of which, the insulation layer and protection layer are made, the soft thermocouple suffers from little impact of shock and can be bent and twisted freely and convenient to install and flexible to use. Therefore, on some given occasion, it is better than sheathed thermocouple. It is mainly applicable to industrial furnace and heat treatment such as aviation, space flight and machinery and temperature measurement and control of production in steel plants, aluminium factories, glass and building materials.

软性热电偶（适用于工业窑炉、航空、航天、机械、玻璃、铝厂、建材的温度测量）

Soft thermocouple（Applicable to the temperature measurement for industrial furnace, aviation, space flight, machinery, glass, aluminum factory and building materials）

（图18 Fig 18）

型号 Model	分度号 Graduation Mark	测量范围 Measuring range (℃)	热响应时间 Thermal response time $\tau \leq 0.5(s)$	
WRE-03	E	0~400	$\leq 0.5$	
WRN-06	K	0~600		

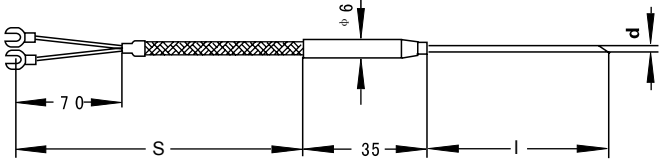
- 注：（1）WR□X-06P型的绝缘层/保护层/屏蔽层，为玻璃纤维/不锈钢。  
（2）线径为： $\phi 0.3\text{mm}$ 、 $0.5\text{mm}$ 、 $0.8\text{mm}$ 、 $1.0\text{mm}$ 。  
（3）L按用户要求制作。

- Note:（1）The insulation coat/ protection layer/shielding layer is of fibre glass/stainless steel.  
（2）The line diameter:  $\phi 0.3\text{mm}$ ,  $0.5\text{mm}$ ,  $0.8\text{mm}$ ,  $1.0\text{mm}$ .  
（3）L shall be manufactured as what the user required.

针状热电偶（适用于食品加工的温度测量）

Needle-shaped thermocouple（Applicable to the temperature measurement for food processing）

（图19 Fig 19）

型号 Model	分度号 Graduation Mark	测量范围 Measuring range (°C)	规格Specification			
			d	l	s	
WRNZ-05	K	0~400	$\phi 1$ $\phi 1.6$ $\phi 2$	100 200	200	
WRTZ-05	T					

注：WR□Z-05型适用于食品加工的温度测量。

Note: the WR□Z-05 series are applicable to the temperature measurement for food processing.

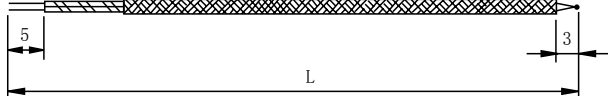
高温软性热电偶（适用于钢铁业、铸铝业、热处理、实验用）

High temperature soft thermocouple（Applicable to steel and iron industry, cast aluminum industry, heat treatment and experiment）

绝缘层用二氧化硅纤维绞缠，保护层用二氧化硅纤维编织。另有一种绝缘层用陶瓷纤维缠绕，保护层用陶瓷纤维编织。

Its insulating layer is made of silicon dioxide fiber and its protective layer is weaved by silicon dioxide fiber. Another insulating layer is made of ceramic fiber and the protective layer is weaved by ceramic fiber.

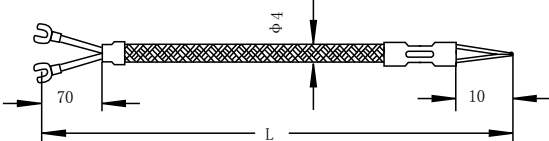
(图20 Fig 20)

型号 Model	分度号 Graduation Mark	温度范围 (°C) Measuring range (°C)	截面 (mm) <sup>2</sup> Section	
WRNG-010	K	0~1000	1.0	
WRNG-015	K	0~1000	1.5	
WRNG-110	K	0~1200	1.0	
WRNG-115	K	0~1200	1.5	

小型热电偶 (适用于塑料工业、挤出机械、包装、烟机的固体表面温度测量)

Small type thermocouple (Applicable to the temperature measurement of solid surface for plastic industry, extruding machine, packing and cigarette machine)

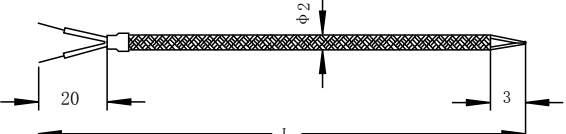
(图21 Fig 21)

型号 Model	分度号 Graduation Mark	温度范围 (°C) Measuring range (°C)	L (mm)	
WRET-02	E	0~400	300 650	
			350 900	
			400 1150	
WRTT-02	T	0~180	450 1650	
			550 2150	

简易热电偶 (适用于食品机械、包装机械的温度测量)

Simple thermocouple (Applicable to the temperature measurement for machinery for food industry and package)

(图22 Fig 22)

型号 Model	分度号 Graduation Mark	温度范围 (°C) Measuring range (°C)	L (mm)	
WRNX-04	K	0~200	300 650	
			350 900	
			400 1150	
WRTX-04	T	-40~+200	450 1650	
			550 2150	



# 铠装热电偶Sheathed thermocouple

铠装热电偶具有细长、容易弯曲、热响应时间快、耐震动、耐温、抗压和坚固耐用等优点。它可用作直接测量，也可以作为装配式热电偶的内芯元件，以取代传统的瓷珠串套式元件。尤其适宜安装在管道之间狭窄、弯曲和要求快速反应，微型化特殊测温场合。

Theathed thermocouple has such advantages as slimness, easy bending, short thermal response time, shock resistance, temperature resistance, compression resistance and robustness. It not only can be used to measure temperature directly, but also used for Assembly thermocouple as core element to replace the conventional magnetic bead string-sleeve-oriented elements. It is particularly suitable to temperature measurement of such miniaturized places between tubes which is narrow and bent and needs quick response.

## 主要技术指标Major technical indexes

铠装热电偶种类、温度范围及允差Temperature measuring range and accuracy (表6 Table 6)

类别Category	代号Code	分度号Graduation Mark	套管外径 External diameter of tube (mm)	测量范围 Measuring range °C	最高使用温度 Maximum application temperature (°C)	允许偏差ΔtTolerance	
						1	2
镍铬—铜镍 Nickel-chromium—cupronickel	WREK	E	≥ φ3	-40~700	700	±1.5°C or ±0.4%t	±2.5°C or ±0.75%t ±2.5°C or ±0.75%t
镍铬—镍硅 Nickel-chromium—nisiroy	WRNK	K		-40~900	950		
铁—铜镍 Ferrum—cupronickel	WRJK	J		-40~500	600		
铜—铜镍 Cuprum—cupronickel	WRCK	T		-40~350	400		
铂铑—铂 Rhodium Platinum—Platinum	WRPK	S	φ5~φ8	0~1100	1300	±1.5°C or ±0.25%t	

## 常温绝缘电阻Insulation resistance at normal temperature

绝缘型铠装热电偶在环境温度为20±15℃，相对湿度不大于80%时，热电极与外套管之间的绝缘电阻应符合下表的规定：

Of the insulated sheathed thermocouple, the insulation resistance between thermode and outer tube shall, under the ambient temperature of 20±15℃ and relative humidity not more than 80%, comply with the stipulation as below:

(表7 Table 7)

铠装热电偶直径d(mm) Diameter of sheathed thermocouple	试验电压 (V·DC) Ecpperimental voltage	绝缘电阻 (MΩ·m) Insulation resistance
0.5~1.5	50±5	≥1000
>1.5	500±50	≥1000

注：绝缘电阻用 (MΩ·m) 表示。即1m长的试样的绝缘电阻为1000MΩ；10m长的试样的绝缘电阻为100MΩ。

Note: The insulation resistance shall be denoted as (MΩ·m), namely, the insulation resisance of 1m-long specimen is 1000 (MΩ·m) and that of the 10m-long is 100MΩ.

## 铠装热电偶可绕半径Windable radius of sheathed thermocouple

铠装热电偶的可绕半径不应小于其直径的5倍，并没有明显的损伤。

The windable radius of sheathed thermocouple shall not less than 5 times of its diameter, and bear no obvious damage.

高温绝缘电阻High-temperature insulation resistance

绝缘型铠装热电偶高温绝缘电阻应符合下表的规定：

The high-temperature insulation resistance of insulated sheathed thermocouple shall comply with the provisions stated below:

(表8 Table 8)

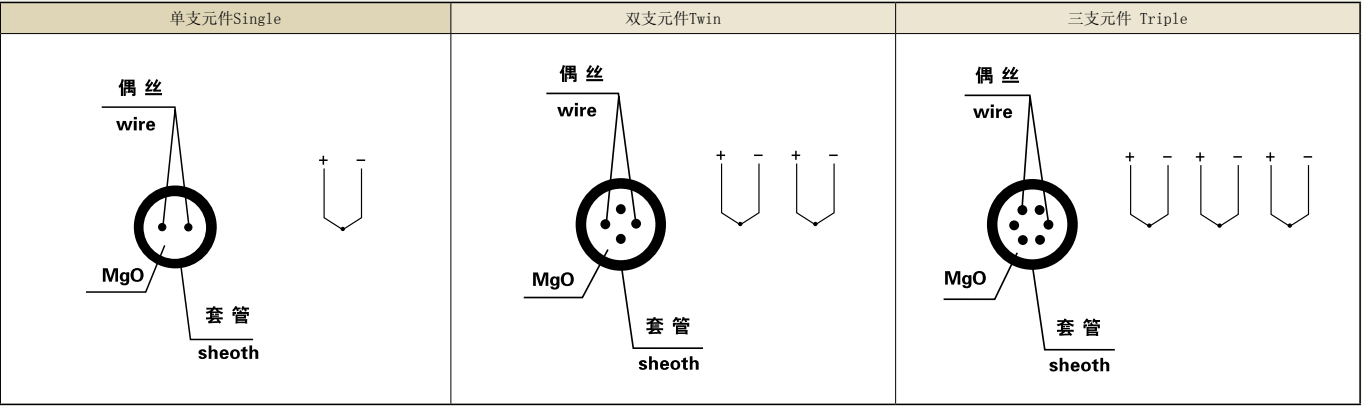
分度号Graduation Mark	试验温场 (mm) Experimental temperature range (mm)	试验温度 (℃) Experimental temperature (℃)	绝缘电阻 (MΩ·m) Insulation resistance (MΩ·m)
K, N, E, J	L=300	500±15	≥5
T		300±10	≥500

注：不同铠装直径的绝缘电阻试验电压，按常温绝缘电阻表中的规定。

Note: The experimental voltage of insulation resistance of different sheathed diameter shall comply with the standard specification shown in normal-temperature insulation resistance table.

铠装热电偶结构型式 Structrue type of sheathed thermocouple material

(图23 Fig 23)

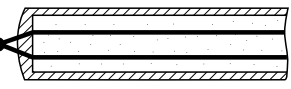
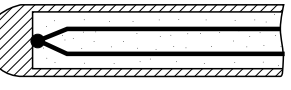
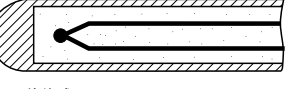
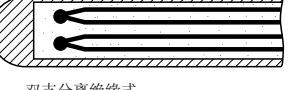


铠装热电偶可供长度、热响应时间、测量端结构及特性 Available length and thermal response time of sheathed thermocouple

在温度发生阶跃变化时，热电偶的输出变化至相当于该阶跃变化的50%，所需要的时间称为热响应时间，用  $\tau_{0.5}$  表示，试验介质通常为水。

When the temperature shown step changes, the output variation of the thermocouple shall be at least equivalent to 50% of the variation, and the time that needs is thermal response time, denoted as  $T_{0.5}$ . Usually, the experimental medium is water.

(图24 Fig 24)

铠装热电偶直径d(mm) Diameter of sheathed thermocouple	可供长度 Available length (m)	保护管材料 Protection tube material	热响应时间 thermal response time $\tau \leq 0.5(s)$			测量端结构形式及特性 Structure shape of the measuring terminal
			露端式 Terminal-exposed type	接壳式 Shell-connecting type	绝缘式 Insulation type	
$\phi 2$	$\leq 80$	*1Cr18Ni9Ti	0.3	0.4	0.5	 <p>露端式 Exposed Junction</p>  <p>接壳式 Ground Junction</p>  <p>绝缘式 Insulated Junction</p>  <p>双支分离绝缘式 Dual divided Insulated Junction</p> <p>1. 测量端接点外露响应速度很快。 2. 适合对温度快速感应的测量。 3. 气密性、抗腐蚀性、机械强度比其它形式差。 1 The respond speed of exposed connection point on measurement terminal is very fast. 2 It can be applicable to measure the temperature of fast induction. 3 It is relatively poor in air impermeability, corrosion resistance and mechanical strength.</p> <p>1. 响应速度较快。 2. 测量端接点同金属外壳接地。 3. 不适用于电磁感应干扰的场所。 1 The respond speed of exposed connection point on measurement terminal is very fast. 2 It can be applicable to measure the temperature of fast induction. 3 It is relatively poor in air impermeability, corrosion resistance and mechanical strength.</p> <p>1. 响应速度比接壳式慢。 2. 绝缘物充实，热电势变小，寿命长。 3. 耐蚀、耐压、耐震、抗电磁感应干扰。 1 Its respond speed is slower than the Ground Junction. 2 It has firm insulating material, lower electric potential and longer length of life. 3 It has the characteristic of corrosion proof, voltage withstand, shockproof and anti-electromagnetic-interference.</p> <p>1. 每对接点被分开，可分别测量或备用。 2. 可避免每对之间的信号干扰。 3. 其它特性同绝缘式。 1 After each pairs of connection points are separated, the separate measurement can be conducted. 2 It can avoid the mutual interference between two pairs. 3 Its other advantages are same to the Insulated Junction.</p>
$\phi 3$	$\leq 50$		0.4	0.6	1.2	
$\phi 4$	$\leq 45$		0.5	0.8	2.5	
$\phi 5$	$\leq 40$		0.7	1.2	4.0	
$\phi 6$	$\leq 35$		0.8	2.0	6.0	
$\phi 8$	$\leq 20$		1.0	4.0	8.0	

注：“\*”常规供货为1Cr18Ni9Ti，如需其它材质另行注明。

Note: the normal delivery of goods is 1Cr18Ni9Ti, if other material is necessary, please note it separately.

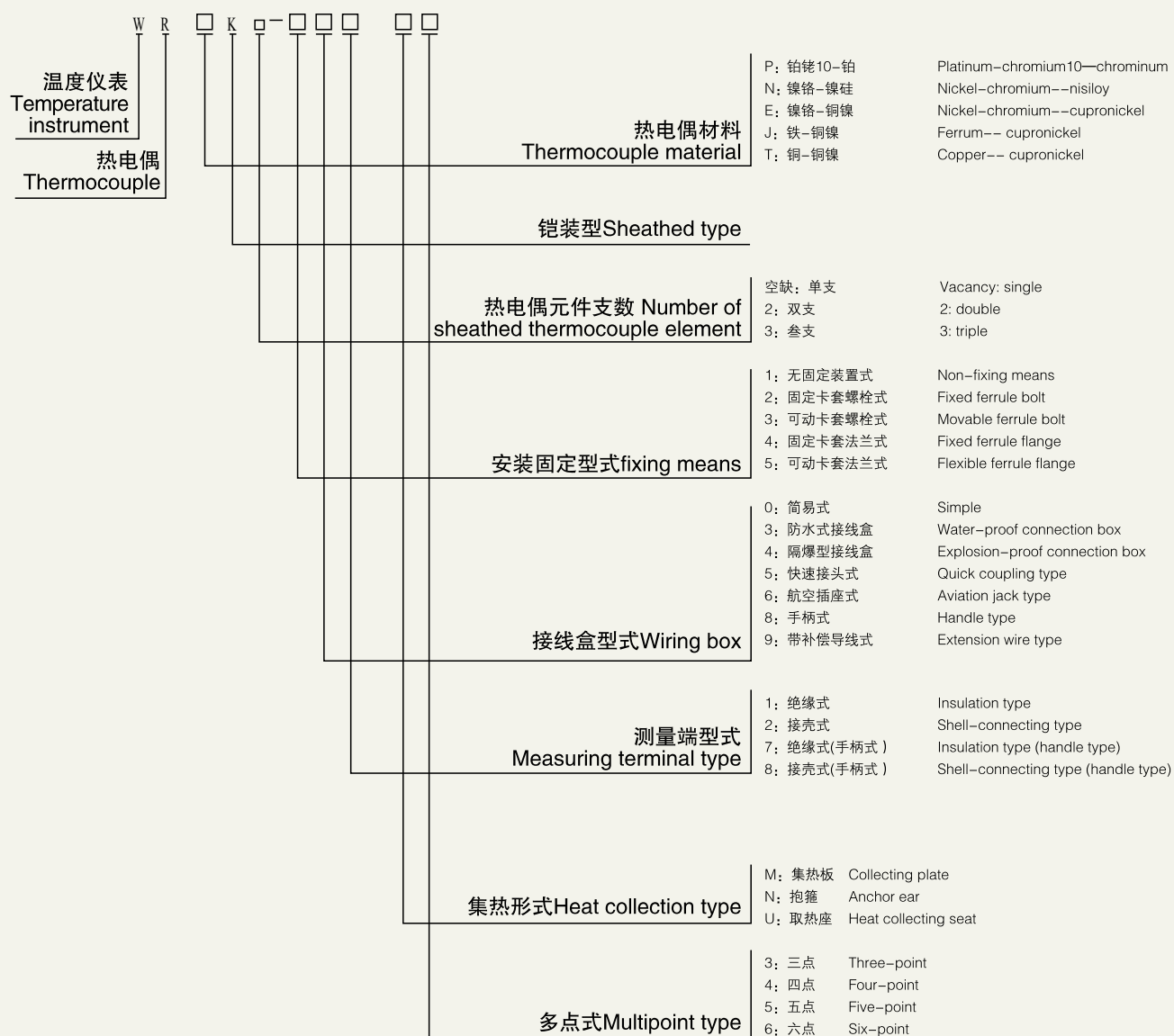
铠装热电偶材料及使用温度Material and application temperature of the sheathed thermocouple

(表9 Table 9)

分度号 Graduation Mark	套管材料 (牌号/代号) Tube Material (Brand and code)	直径 d (mm) Diameter	使用最高温度 (°C) Highest application temperature (°C)	
			长期 Long term	短期 Short term
S	GH3030	4.0, 4.5	1000	1100
		5.0, 6.0, 8.0	1100	1200
K/N	310S GH3030	4.0, 5.0	1000	1100
		6.0, 8.0	1100	1200
	1Cr18Ni9Ti 304 316、316L	1.0	400	600
		1.5, 2.0	600	700
		3.0, 4.0, 5.0, 6.0, 8.0	800	900
E	1Cr18Ni9Ti 304 316、316L	1.5, 2.0	500	600
		3.0, 4.0, 5.0	600	700
		6.0, 8.0	700	800
J	1Cr18Ni9Ti 304 316、316L	1.5, 2.0	400	500
		3.0, 4.0, 5.0	500	600
		6.0, 8.0	600	750
T	1Cr18Ni9Ti 304、316、316L	1.5, 2.0, 4.0, 4.5, 5.0	300	350
		6.0, 8.0	300	400

## 铠装热电偶型号命名

## Designation of sheathed thermocouple model



## 安装固定型式Installation of fixed forms

固定装置是供用户安装用。除了无固定装置产品外，铠装热电偶固定装置有：固定卡套式、可动卡套式、固定法兰式、可动法兰式四种结构型式。固定卡套式供用户一次性固定；可动卡套式用户可多次固定。

The fixed devices are for installation for users. Except the products that have no fixed devices, the fixed devices of sheathed thermocouple covers four structure configurations, such as fixed ferrule type, movable ferrule type, fixed flange type and movable flange type. Fixed ferrule type is used for only-one-time fixation for users, but the movable ferrule type can be fixed many times by users.



卡套螺栓 Femule bolt

(表10 Table 10)

铠装热电偶外径 External diameter of sheathed thermocouple	$\phi 8$	$\phi 6$	$\phi 5$	( $\phi 4.5$ )	$\phi 4$	$\phi 3$	$\phi 2$
固定装置代号和尺寸 Code and dimension of fixed device	M16×1.5				M12×1.5		
M							
S	22				19		

注：（1）参见90页，图141，括号内的数字这一挡规格一般不予采用，如果需要作特殊规格订货。

Note: (1) refer to page 90, Fig 141. The specification in the column within numbers in parentheses usually will not be adopted, if considered to be special order specification.

卡套法兰 Femule flange

(表11 Table 11)

铠装热电偶外径 External diameter of sheathed thermocouple d	$\phi 8$	$\phi 6$	$\phi 5$	( $\phi 4.5$ )	$\phi 4$	$\phi 3$	$\phi 2$
固定装置代号和尺寸 Code and dimension of fixed device							
D	$\phi 60$				$\phi 50$		
D0	$\phi 42$				$\phi 36$		
D1	$\phi 24$				$\phi 20$		
S	22				19		
d	$\phi 9$				$\phi 7$		

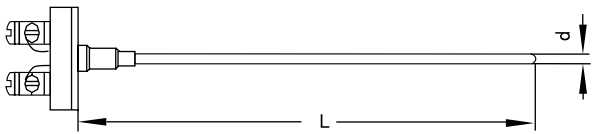
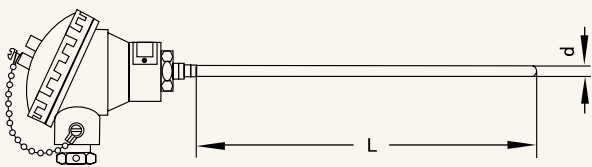
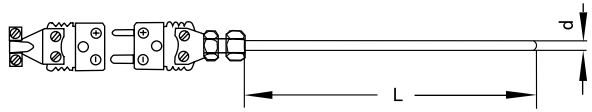
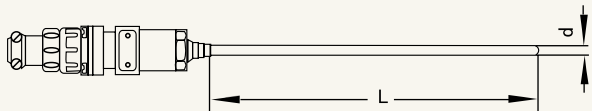
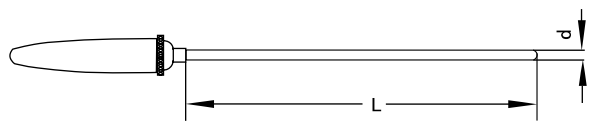
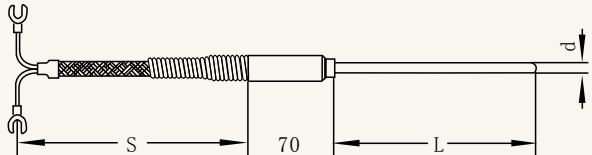
注：（1）参见92页，图149。括号内的数字这一挡规格一般不予采用，如果需要作特殊订货。

Note: (1) refer to page 92, Fig 149. The specification in the column within numbers in parentheses usually will be not adopted, if considered to be special order specification.

## 型号规格Type specification

### 无固定装置式铠装热电偶 Non-fixed device sheathed thermocouple

(图25 Fig 25)

接线端形式 Connection box type	型号Model	示意图Schematic diagram
简易式 Simple type	WR□K-101 WR□K <sub>2</sub> -101	
防水式 Water-proof type	WR□K-131 WR□K <sub>2</sub> -131	
快速接头式 Quick coupling type	WR□K-151 WR□K <sub>2</sub> -151	
航空插座式 Aviation jack type	WR□K-161 WR□K <sub>2</sub> -161	
手柄式 Handle type	WR□K-187 WR□K <sub>2</sub> -187	
带补偿导线式 Extension wiretype	WR□K-191 WR□K <sub>2</sub> -191	

注：（1）WRNK-101可用于装配式热电偶铠装内芯的更换。（2）带补偿导线式常规附带500mm引线，如需增加请注明长度。  
（3）测量端常规供货为绝缘式，如需接壳，型号尾数“1”改为“2”；“7”改为“8”。例：131改为132；187改为188。  
（4）铠装热电偶的分度号、测量范围、热响应时间、直径、可供长度参见18-20页，表6、图24。

Note: (1) WRNK-101 can be used to replace the inner core of assembly thermocouple. (2) Extension wiretype usually is attached with 500mm lead wire, if need to add, please indicate the length. (3) The measuring terminal is supplied with insulation type. If it needs to be connected with the shell, change the model mantissa “1” to “2”, “7” is changed to be “8”. for example 131 is changed to be 132; 187 is changed to be 188. (4) Refer to Page 18-20, Table 6 and Fig 24 for the graduation mark, measurement range. Response time, diameter and available length of the sheathed thermocouple.

卡套螺栓式铠装热电偶 Ferrule bolt type sheathed thermocouple

(图26 Fig 26)

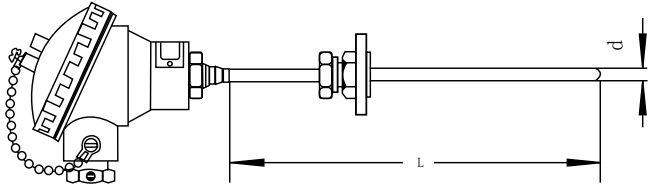
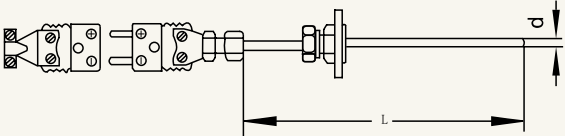
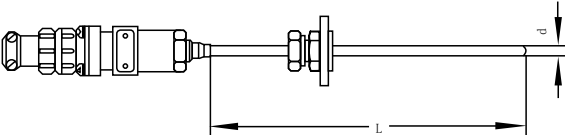
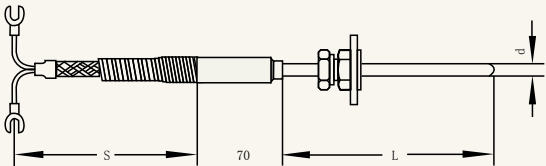
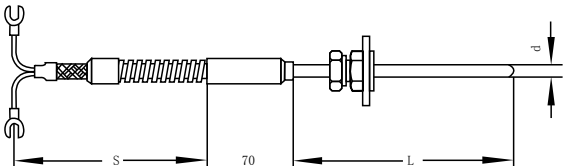
接线端形式 Connection box type	型号Model	示意图Schematic diagram
防水式 Water-proof type	WR□K-231 WR□K <sub>2</sub> -231 WR□K-331 WR□K <sub>2</sub> -331	
快速接头式 Quick coupling type	WR□K-251 WR□K <sub>2</sub> -251 WR□K-351 WR□K <sub>2</sub> -351	
航空插座式 Aviation jack type	WR□K-261 WR□K <sub>2</sub> -261 WR□K-361 WR□K <sub>2</sub> -361	
带补偿导线式 Extension wiretype	WR□K-291 WR□K <sub>2</sub> -291 WR□K-391 WR□K <sub>2</sub> -391	
带补偿导线式 (不锈钢软管) Extension wiretype(stainless steel flexible tube)	WR□K-291G WR□K <sub>2</sub> -291G WR□K-391G WR□K <sub>2</sub> -391G	

注：（1）带补偿导线式常规附带500mm引线，如需增加请注明长度。  
（2）测量端常规供货为绝缘式，如需接壳，型号尾数“1”改为“2”。例：231改为232；291改为292。  
（3）铠装热电偶直径 $\geq \phi 5$ 卡套螺栓的螺栓常规供货为M16 $\times$ 1.5； $\leq \phi 4$ 为M12 $\times$ 1.5。  
（4）固定卡套螺栓公称压力：2.5MPa。活动卡套螺栓公称压力为常压。  
（5）铠装热电偶的分度号测量范围、热响应时间、直径、可供长度参见18-20页，表6，图24。

Note: （1）500mm lead wire is usually attached to the extension wiretype, if need to add, please indicate the length.  
（2）The measuring terminal is supplied with insulation type. If it needs to connect with the shell, change the model mantissa “1” to “2”, for example 231 is changed to be 232; 291 is changed to be 292.  
（3）The diameter of the sheathed thermocouple is not less than  $\phi 5$ . The general supply for screw bolt of ferrule bolts is M16 $\times$ 1.5 and  $\leq \phi 4$  is M12 $\times$ 1.5.  
（4）The fixed ferrule flang’s nominal pressure is 2.5MPa. The movable ferrule flang’s nominal pressure is normal pressure.  
（5）Refer to Page 18-20, table 6 and fig 24 for the graduation mark, measurement range. Response time, diameter and available length of the sheathed thermocouple.

卡套法兰式铠装热电偶Ferrule flange type sheathed thermocouple

(图27 Fig 27)

接线端形式Connection box type	型号Model	示意图Schematic diagram
防水式 Water-proof type	WR□K-431 WR□K <sub>2</sub> -431 WR□K-531 WR□K <sub>2</sub> -531	
快速接头式 Quick coupling type	WR□K-451 WR□K <sub>2</sub> -451 WR□K-551 WR□K <sub>2</sub> -551	
航空插座式 Aviation jack type	WR□K-461 WR□K <sub>2</sub> -461 WR□K-561 WR□K <sub>2</sub> -561	
带补偿导线式 Extension wiretype	WR□K-491 WR□K <sub>2</sub> -491 WR□K-591 WR□K <sub>2</sub> -591	
带补偿导线式 (不锈钢软管) Extension wiretype (stainless steel flexible tube)	WR□K-4911G WR□K <sub>2</sub> -4911G WR□K-5911G WR□K <sub>2</sub> -5911G	

- 注：(1) 带补偿导线式 “S” 常规附带500mm引线，如需增加请注明长度。  
 (2) 测量端常规供货为绝缘式，如需接壳，型号尾数“1”改为“2”。例：431改为432。  
 (3) 铠装热电偶直径 $\geq \Phi 5$ 卡套法兰盘常规供货为 $\Phi 60$ ； $\leq \Phi 4$ 为 $\Phi 50$ 。  
 (4) 固定卡套法兰公称压力：2.5 MPa。活动卡套法兰公称压力为常压。  
 (5) 铠装热电偶的分度号测量范围、热响应时间、直径、可供长度参见18-20页，表6，图24。

Note: (1) 500mm lead wire is usually attached to the extension wiretype “S”, if need to add, please indicate the length separately.  
 (2) The measuring terminal is supplied with insulation type. If it needs to connect with the shell, change the model mantissa “1” to be “2”, for example, 431 is changed to be 432.  
 (3) The diameter of the sheathed thermocouple is not less than  $\Phi 5$ . The general supply for ferrule flange is  $\Phi 60$  and  $\leq \Phi 4$  is  $\Phi 50$ .  
 (4) The fixed ferrule flange's nominal pressure is 2.5 MPa. The movable ferrule flange's nominal pressure is normal pressure.  
 (5) Refer to page 18-20, table 6 and fig 24 for the graduation mark, measurement range. Response time, diameter and available length of the sheathed thermocouple.

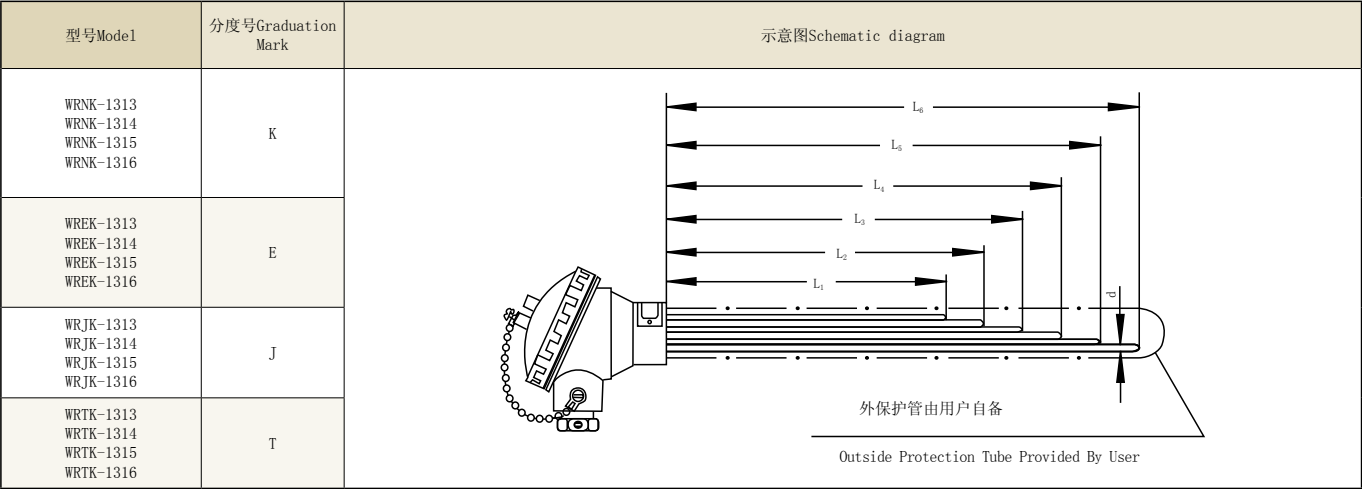


多点型铠装热电偶Multipoint sheathed thermocouple

多点型铠装热电偶有非隔爆型和隔爆型。适用于测量合成塔、反应罐等设备，可同时测量不同层面或同一层面各个点不同的气态或液态等介质的温度。各点的长度可按用户要求分别制作。

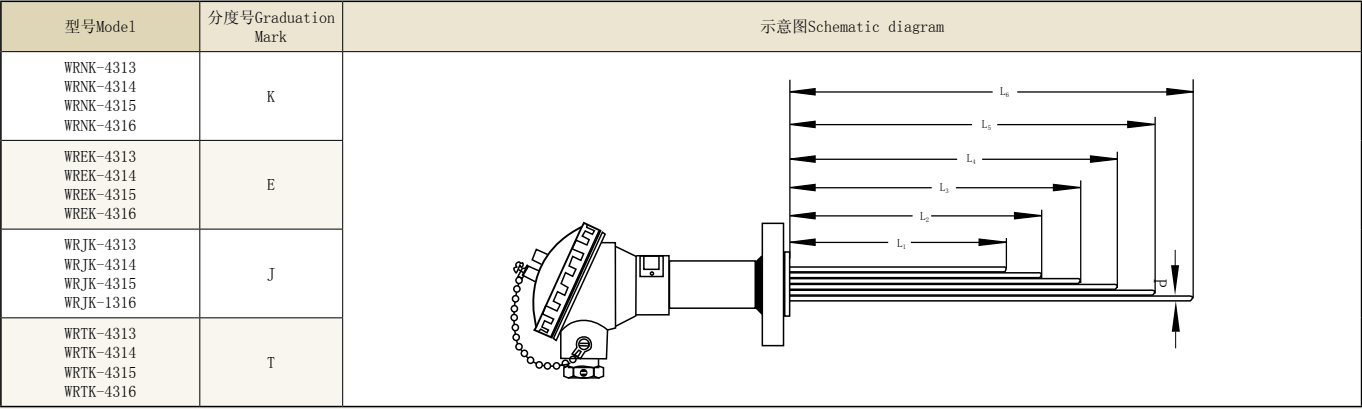
Multipoint sheathed thermocouples cover non-explosion-suppression ones and explosion-suppression ones. They are applicable to measuring equipment such as synthesizing tower and reaction pot, being able to measure the temperature of different mediums (such as gaseous mediums or liquid mediums) at the same layer or the different points in the same layer. The length of such points may manufactured by the users' needs.

无固定装置多点式铠装热电偶Non-fixed device multipoint sheathed thermocouple without device (图28 Fig 28)



注：（1）多点式铠装热电偶外径d（mm）为Φ3、Φ4、Φ5、Φ6四种。  
（2）常规多点式热电偶分三点、四点、五点、六点四种规格。  
Note: (1) Multipoint sheathed thermocouple's external dameter d (mm) is divided into four classes: Φ3, Φ4, Φ5 and Φ6.  
(2) The ordinary multipoint thermocouple covers four specifications: thiple-point, four-point, five-point and six-point.

固定法兰多点式铠装热电偶 Fixed flange multipoint sheathed thermocouple (图29 Fig 29)



注：（1）多点式铠装热电偶外径d（mm）为Φ3、Φ4、Φ5、Φ6四种。  
（2）常规多点式热电偶分三点、四点、五点、六点四种规格。  
Note: (1) Multipoint sheathed thermocouple's external dameter d (mm) is divided into four classes: Φ3, Φ4, Φ5 and Φ6.  
(2) The ordinary multipoint thermocouple covers four specifications: thiple-point, four-point, five-point and six-point.

## 长度规格Length specification

(表12 Table 12)

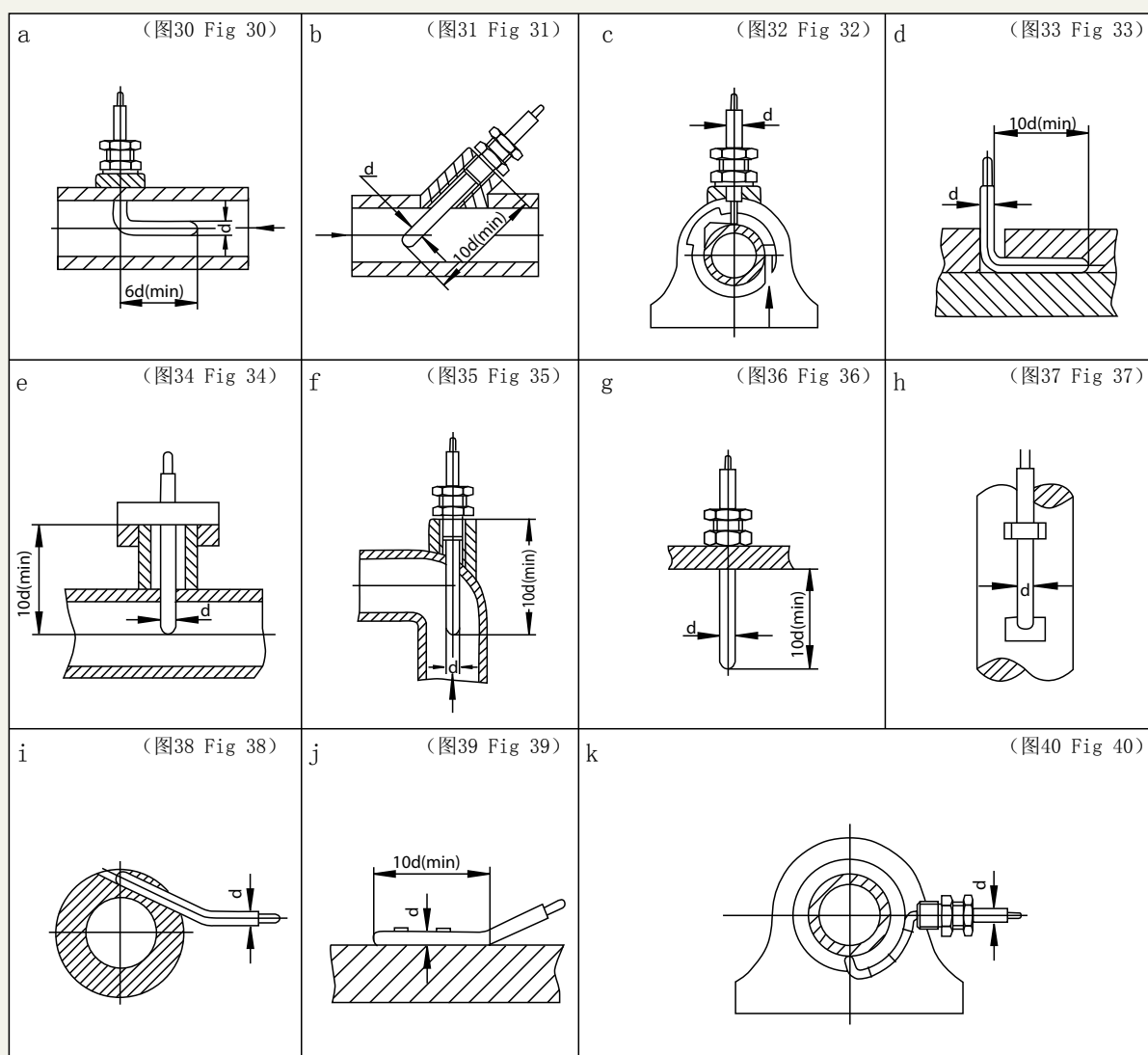
序号Serial No.	L1	L2	L3	L4	L5	L6
1	830	2220	2420	3500	4940	7320
2	890	2320	2470	3600	6080	7370

注：以上长度供参考，各点长度均可任意选择，点数可根据需要增减。

Note: The length mentioned above is for information only. The length at any point can be chosen at will and the point number can be increase or reduce as required.

## 铠装热电偶安装示意图

## Scheme of information of thermal resistance of sheathed thermocouple



# 热电偶用补偿导线Thermocouple extension wire

热电偶用补偿导线是用于延伸热电极，即：移动热电偶的冷端与显示仪表连接构成测温系统。

Thermocouple extension wire is used to extend the thermode, that is, the cold junction of the movable thermocouple connect with indicating instrument to make up temperature measurement system.

补偿导线分为延长型和补偿型两种。与热电偶分度号的两偶丝材料相同的导线称延长型。不同配比的铜—铜镍材料制成的导线，称补偿型。

Extension wire falls into two kinds; one is extension type and the other is compensation type. The wire same with the two thermocouple wires of the Graduation Mark, is known as the extension type. The wire same with, formed by copper—cupronickel materials with different proportion, is called compensation type.

两种补偿导线均有优良的耐酸、碱和耐磨阻燃的性能。常用温度范围为 $-25\sim +200^{\circ}\text{C}$ ，可浸入油中长期使用。补偿导线符合GB/T4989—1994标准。

The two kinds of extension wire, both have good property of resistance to acid, alkali, abrasion and fire. Its temperature range used commonly is  $-25\sim +200^{\circ}\text{C}$ . In addition, it can be used for a long time by immersing into the oil. The extension wire complies with GB/T4989-94-1994 standard.

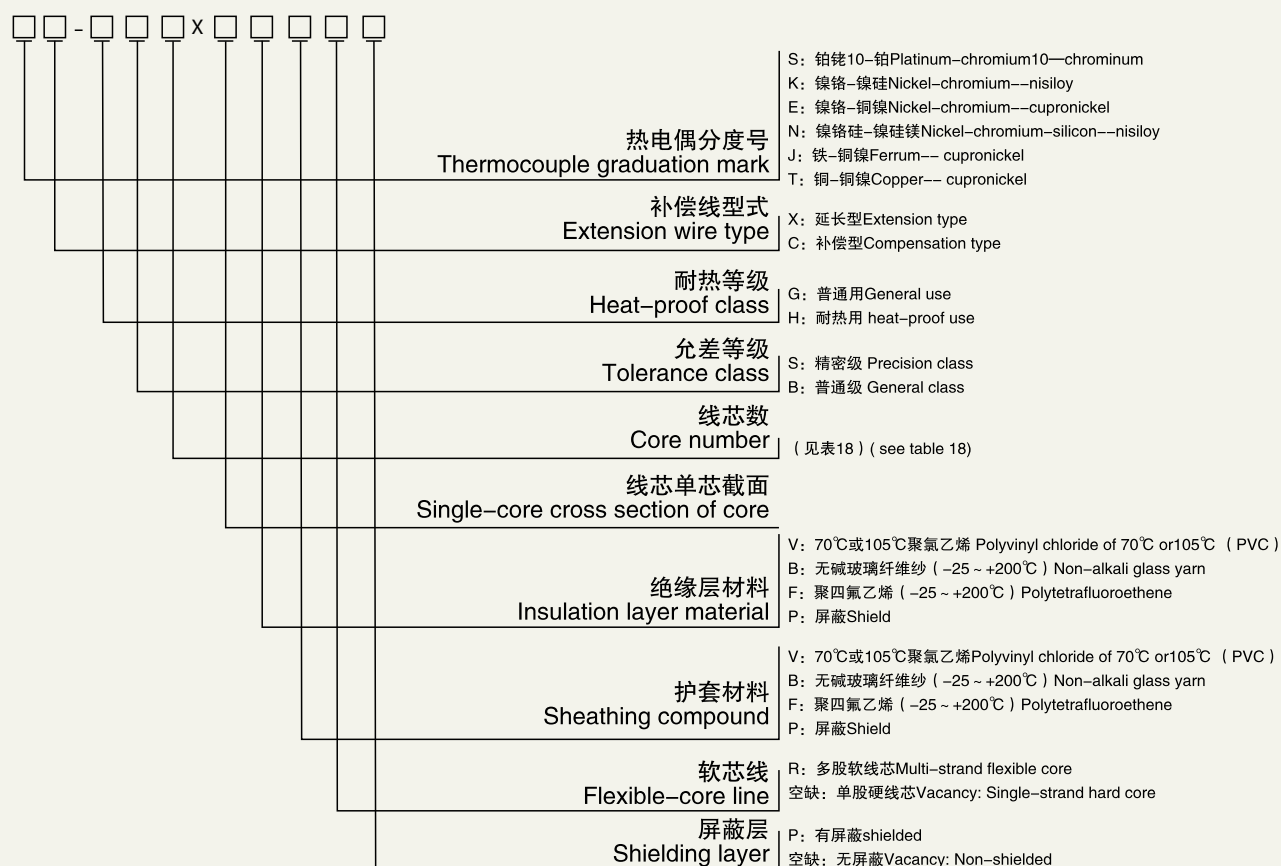
所列补偿导线适用于分度号为S、(R)、K、E、J、T。

The extension wire listed in the table is applicable to the graduation symbol of S, (R), K, E, J and T.

补偿导线型号按产品的型号划分为：SC、KC、KX、EX、JX、TX。

The extension wire types can be divided into SC, KC, KX, EX, JX and TX in accordance with the product type.

## 型号命名Type designation extension wire



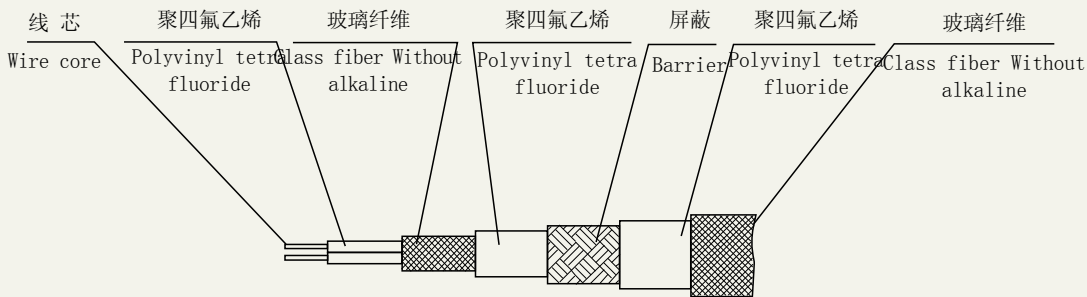
补偿导线的分类、等级及标志如下表所示:

Classification, grade, and mark of the extension wire are shown as the table.

(表13 Table 13)

使用分类 Usage classification	标志 Mark	允差等级及标志 Permissible grade and mark		护层的着色 Coloring of the cover	
		普通级 Ordinary grade	精密级 Precision grade	精密级 Precision grade	普通级 Ordinary grade
一般用 General use	G	B	A	灰色Gray	黑色Black
耐热用 Thermal resistance use	H			黄色Yellow	黑色Black

## 结构型式 Structrue type



绝缘层、护层及屏蔽层用材料及符号如下表所示（等级）：

Materials for insulation layer, cover and shielding layer and the symbol are shown as below (grade):

(表14 Table 14)

等级 Grade	绝缘层Insulation layer		护层Cover		屏蔽层Shielding layer	
一般用 (G) General use	材料 Material	符号表示 Symbol	材料 Material	符号表示 Symbol	材料 Material	符号表示 Symbol
	聚氯乙烯 Polyvinyl chloride	PVC	聚氯乙烯 Polyvinyl chloride	PVC	镀锌钢丝 Zinc coated wire 镀锡铜丝 Tinned copper wire 复合铝带 Clad aluminium strip 铜带 Copper strip	P
耐热用 (H) Thermal resistance use	聚四氟乙烯 Polytetrafluoroethylene 玻璃纤维 Glass fiber	F B	玻璃丝 Glass fiber	B		

产品分度号、符号及代号 Product graduation mark, symbol and code

(表15 Table 15)

分度号Graduation Mark	一般用 (G) 产品标号 General Item No.		耐热用 (H) 产品标号 Heat-proof Item No.	
	精密级 Precision grade	普通级 Ordinary grade	精密级 Precision grade	普通级 Ordinary grade
S 或(or) R	SC-GS	SC-GB	—	SC-HB
K	KC-GS	KC-GB	—	KC-HB
	KX-GS	KX-GB	KX-HS	KX-HB
N	NC-GS	NC-GB	NC-HS	NC-HB
E	EX-GS	EX-GB	EX-HS	EX-HB
J	JX-GS	JX-GB	JX-HS	JX-HB
T	TX-GS	TX-GB	TX-HS	TX-HB



### 补偿导线合金丝极性、绝缘层和护套颜色

Polarity sheathing and insulating layer color of alloy wires of extension wire

(表16 Table 16)

补偿导线类型 Extension wire type	热电偶分度号 Graduation mark of thermocouple	补偿导线合金丝 Alloy wire of extension wire		绝缘层颜色 Insulating layer color		护套颜色 Sheathing color			
		正极 Positive pole	负极 Negative pole	正极 Positive pole	负极 Negative pole	一般用General use		耐热用Heat resisting use	
						普通级 Common	精密级 Precision	普通级 Common	精密级 Precision
SC、RC	S (铂铑10-铂 Rhodium-Platinum10-Rhodium)	SPC (铜 Cuprum)	SNC (铜镍 cupronickel)	红Red	绿Green	黑Black	灰Grey	黑Black	黄Yellow
NC	N (镍铬硅-镍硅 Nickel-chromium-silicon-nickel-silicon)	NPC (铁 Ferrum)	NNC (铜镍 cupronickel)	红Red	灰Grey	黑Black	灰Grey	黑Black	黄Yellow
KC	K (铜-康铜Cuprum-constantan)	KPC (铜 Cuprum)	KNC (铜镍 cupronickel)	红Red	蓝Blue	黑Black	灰Grey	黑Black	黄Yellow
KX	K (镍铬-镍硅Nickel-chromium-nickel-silicon)	KPX (镍 Nickel-chromium)	KNX (镍硅 Nickel-silicon)	红Red	黑Black	黑Black	灰Grey	黑Black	黄Yellow
EX	E (镍铬-铜镍 Nickel-chromium-cupronickel)	EPX (镍 Nickel-chromium)	ENX (铜镍 cupronickel)	红Red	棕Brown	黑Black	灰Grey	黑Black	黄Yellow
JX	J (铁-铜镍Ferrum-cupronickel)	JPX (铁 Ferrum)	JNX (铜镍 cupronickel)	红Red	紫Purple	黑Black	灰Grey	黑Black	黄Yellow
TX	T (铜-铜镍 Cuprum-cupronickel)	TPX (铜 Cuprum)	TNX (铜镍 cupronickel)	红Red	白White	黑Black	灰Grey	黑Black	黄Yellow

注：本质安全电路用补偿导线，其护套均采用蓝色。

Note: The color of extension wire used for safety circuit and its sheathing shall be blue.

### 补偿导线热电动势、允差范围和往复电阻值

Extension wire's thermal electromotive force, allowance range and reciprocating resistance value

(表17 Table 17)

型号 Type	热电动势和允差 Thermer electromovtive force and allowance						往复电阻Reciprocating resistance
	0~100℃			0~200℃			20℃时，长度为1m，截面积为1mm <sup>2</sup> When the temperature is 20℃, the length is 1m and the sectional area is 1mm <sup>2</sup> .
	热电动势 Thermer electromovtive force μ V	允差Tolerance		热电动势 Thermer electromovtive force μ V	允差Tolerance		
		精密级 (A) Precision grade	普通级 (B) Ordinary		精密级 (A) Precision grade	普通级 (B) Ordinary grade	
SC	645	±30 μ v (±2. 5℃)	±60 μ V (±5℃)	1440		±60 μ V (±5℃)	0. 05
KC	4095	±60 μ V (±1. 5℃)	±100 μ V (±2. 5℃)	8137	±60 μ V (±1. 5℃)	±100 μ V (±2. 5℃)	0. 52
KX	4095	±60 μ V (±1. 5℃)	±100 μ V (±2. 5℃)	8137	±60 μ V (±1. 5℃)	±100 μ V (±2. 5℃)	1. 1
NC	2774	±60 μ V (±1. 5℃)	±100 μ V (±2. 5℃)	5912	±60 μ V (±1. 5℃)	±100 μ V (±2. 5℃)	0. 75
NX	2774	±60 μ V (±1. 5℃)	±100 μ V (±2. 5℃)	5912	±60 μ V (±1. 5℃)	±120 μ V (±2. 5℃)	1. 43
EX	6317	±120 μ V (±2. 5℃)	±120 μ V (±2. 5℃)	13419	±120 μ V (±1. 5℃)	±120 μ V (±2. 5℃)	1. 25
JX	5268	±85 μ V (±1. 5℃)	±140 μ V (±2. 5℃)	10777	±85 μ V (±1. 5℃)	±140 μ V (±2. 5℃)	0. 65
TX	4277	±30 μ V (±0. 5℃)	±90 μ V (±2. 5℃)	9285	±48 μ V (±0. 8℃)	±90 μ V (±1. 5℃)	0. 52

补偿导线的线芯截面、股数，单线直径及绝缘层、护层和外径尺寸：

Core cross section, number of strands of extension wire, single line diameter and insulation layer, cover and outside dimension

(表18 Table 18)

使用分类 Usage category	标称截面 Nominal cross- sectional area	单股线芯 single-strand core		多股线芯 Multi-strand core		绝缘层厚度 Thickness of insulation layer (mm)	护套厚度 Sheath thickness (mm)	外径上限Upper limit external diameter			
		线芯股数 Number of strand (根 piece)	单线直径 Single-wire diameter (mm)	线芯股数 Number of strand (根 piece)	单线直径 Single- wire diameter (mm)			扁平型 Flat type		屏蔽扁平型 Shielding flat type	
								单股线芯 single- strand core	多股线芯 Multi-strand core	单股线芯 single-strand core	多股线芯Multi- strand core
一般用 General use (G)	0.2	1	0.52	7	0.2	0.4	0.7	3.0×4.6	3.1×4.8	3.8×5.4	3.9×6.0
	0.5	1	0.8	7	0.3	0.5	0.8	3.7×6.4	3.9×6.6	4.5×7.2	4.7×7.4
	1	1	1.13	7	0.43	0.7	1.0	5.0×7.7	5.1×8.0	5.8×8.5	5.9×8.8
	1.5	1	1.37	7	0.52	0.7	1.0	5.2×8.3	5.5×8.7	6.0×9.1	6.3×9.6
	2.5	1	1.76	19	0.41	0.7	1.0	5.7×9.3	5.9×9.8	6.5×10.1	6.7×10.7
耐热用 Heat-proof use (H)	0.2	1	0.52	7	0.2	0.4	0.7	2.3×4.0	2.4×4.2	3.0×5.3	3.1×5.6
	0.5	1	0.8	7	0.3	0.5	0.5	2.6×4.6	2.8×4.8	3.7×5.8	3.8×6.0
	1	1	1.13	7	0.43	0.5	0.5	3.0×5.3	3.1×5.6	4.3×6.5	4.5×6.9
	1.5	1	1.37	7	0.52	0.5	0.6	3.2×5.8	3.4×6.2	4.8×7.3	5.0×7.7
	2.5	1	1.76	19	0.41	0.5	0.6	3.6×6.7	4.0×7.3	5.3×8.1	5.6×8.7

## 订货举例Examples of order

订货时请写明:名称型号、耐热等级、规格和长度。

Please mark the designation type, thermal endurance class, specification and length when the goods is ordered.

例1: KX-HB 2×1 FFRP 100m

即: 用于K分度号热电偶, X型补偿导线, 耐热用等级, 普通级允差, 2芯, 每芯1mm<sup>2</sup>, 聚四氟乙烯为绝缘层和护套材料, (耐热200℃) 多股软芯, 有屏蔽, 100米长。

For example: KX-HB 2×1 FFRP 100m is used for thermocouple with K graduation mark and X extension wire. It is of heat-proof use class and normal tolerance. It has two cores, of whih, each is 1 mm<sup>2</sup>. The material for the insulation layer and sheath is polytetrafluoroethylene. With muti-strand soft core( resistance to a temperature of 200℃), it has shield of 100m long.

例2: EC-GS2×1 VVP 200m

用于E分度号热电偶, G型补偿导线, 普通用等级, 精密级允差, 2芯, 每芯1mm<sup>2</sup>, 聚氯乙烯为绝缘层和护套材料(耐热105℃以下), 硬芯线, 有屏蔽, 长200米。

For example: EC-GS2×1 VVP 200m is used for thermocouple with E graduation mark and G extension wire. It is of general use class and precision-grade tolerance. It has two cores, of whih, each is 1 mm<sup>2</sup>. The material for the insulation layer and sheath is polyvinyl chloride. With solid core( resistance to a temperature below 105℃), it has shield of 200m long.

## 装配式热电阻

### Packaged thermal resistance



工业用热电阻分铂热电阻和铜热电阻两大类。

Industrial thermal resistance contains two categories, Pt thermal resistance and Copper thermal resistance.

热电阻是利用物质在温度变化时自身电阻也随着发生变化的特性来测量温度的。热电阻的受热部分（感温元件）是用细金属丝均匀地双绕在绝缘材料制成的骨架上。当被测介质中有温度梯度存在时，所测得的温度是感温元件所在范围内介质层中的平均温度。

Thermal resistance is used to measure temperature on the basis of the property that substances' own resistance varies with the temperature. The part of the thermal resistance that is heated (temperature-sensing element) is made by dual winding of fine wires around the frame made of insulation materials. When there is temperature gradient in the mediums to be measured, the measured temperature is the average temperature in the dielectric layer within the range where the temperature-sensing element is placed.

装配式热电阻主要由接线盒、保护管、接线端子、绝缘套管和感温元件组成，并配以各种安装固定装置。

Packaged thermal resistance consists of connection box, protection tube, connection terminal, insulating sleeve and various fixed devices.

WZP型铂电阻的感温元件是一个铂丝绕组，双支铂电阻主要用于需要用二次显示、记录或调节仪同时检测同一地点温度的场合。WZC型铜电阻的感温元件是一个铜丝绕组。

WZP Pt resistance's temperature-sensing element is a Pt wire winding. Double platinum resistance mainly is used for such situation where it is required to use secondary display instrument, recorder and accommodator to simultaneously detect the temperature of the same place. WZC copper resistance's temperature-sensing element is a copper wire winding.

## 热电阻测温原理

### Temperature measurement principle of thermal resistance

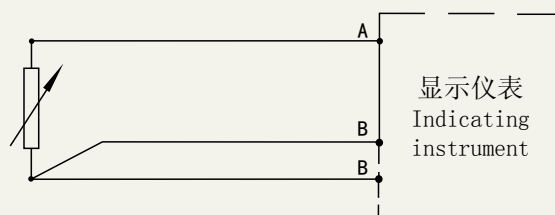
受热后的金属丝电阻随着温度的变化而变化，其热电阻值 $R(t)$ 与其所处温度 $t$ 的关系可表示为：
$$R(t) = R_0(1 + At + Bt^2 + \dots)$$

按测得的电阻值查相应分度号表即可得出被测温度值 $t$ 。或由显示仪表直接读出。

The resistance of the metal wire that has been heated varies with the temperature, and the relation between the thermal resistance value and the temperature it is at can be expressed as  $R(t) = R_0(1 + At + Bt^2 + \dots)$

According to the resistance value that is measured refer to corresponding graduation mark, the temperature  $t$  that is measured can be come out, or read it directly from the indicating instrument.

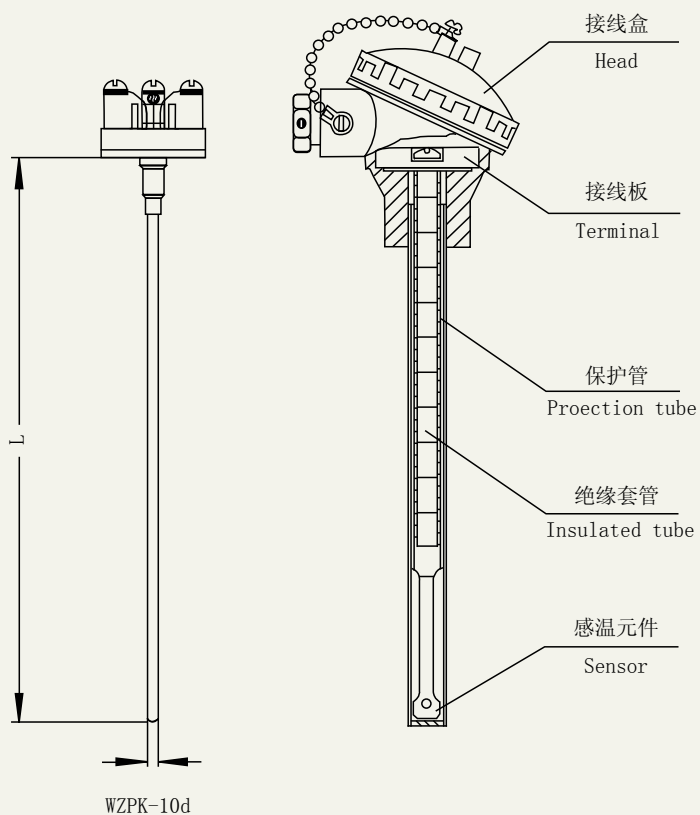
## 热电阻基本结构 Basic structure of thermal resistance



热电阻测温原理  
Measuring Principle Of RTD

## 主要技术指标 Major technical indexes

(图41 Fig 41)





热电阻类型，测量范围与允差Thermal resistance type, Measuring range and tolerance (表19 Table 19)

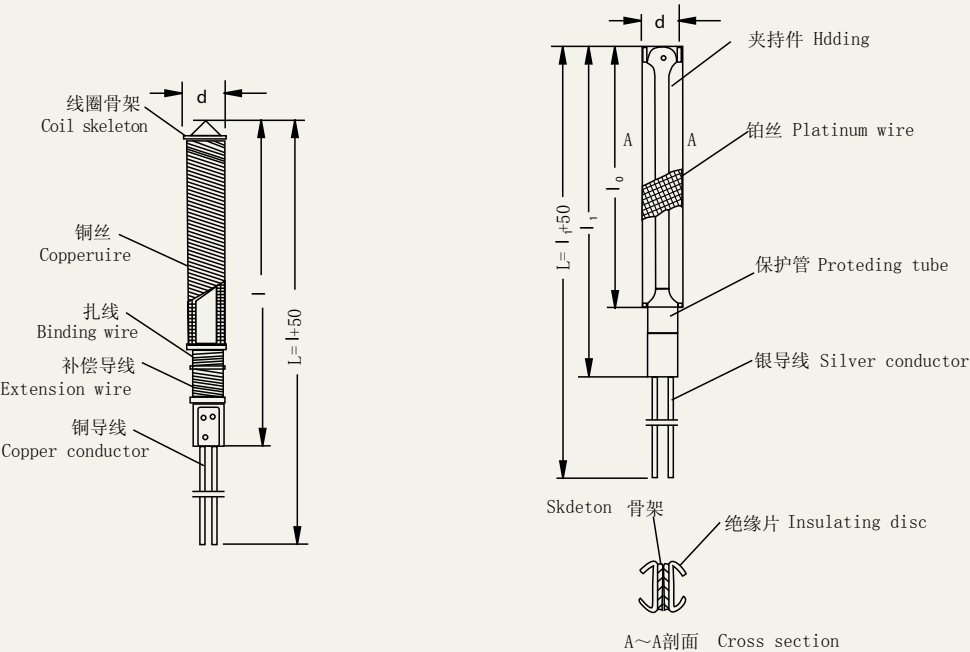
类型 Type	代号 Code	分度号 Graduation mark	测量范围 Measurment range (℃)	允许偏差Δt (℃) Tolerance
铂热电阻 Platinum thermal resistance	WZP	Pt100	-200~+850	A级: (-200~+650) ± (0.15+0.002 t )
				B级: (-200~+850) ± (0.30+0.005 t )
铜热电阻 Copper thermal resistance	WZC	Cu100	-50~+150	± (0.30+0.006 t )

注：（1）其中“| t |”为感温元件的实测温度的绝对值。  
（2）陶瓷骨架铂热电阻元件测量范围-200~+850℃。  
（3）云母骨架铂热电阻元件测量范围-200~+420℃。  
（4）厚膜铂热电阻元件、薄膜铂热电阻元件测量范围-70~600℃。

Note: (1) Of which, “| t |” is the absolute value of the measured temperature of the temperatue-sensing element.  
(2) The Measuring range of the thermal resistance element with pottery frame is 200~+850℃.  
(3) The Measuring range of the thermal resistance element with mica frame is -200~+420℃.  
(4) The Measuring range of the thick-film Pt thermal resistance element and the thin-film Pt thermal resistance element is -70~600℃.

热电阻感温元件 Temperature-sensing element of thermal resistnace

(图42 Fig 42)



铜电阻感温元件

铂电阻感温元件

Temperature-sensing element of copper resistance      Temperature-sensing element of Pt resistance

热响应时间Thermal response time

在温度发生阶跃变化时，热电阻的输出变化至相当于该阶跃变化的50%，所需要的时间称为热响应时间，用τ0.5表示，实验介质通常为水。

When the temperature shown step changes, the output variation of the thermal resistance shall be at least equivalent to 50% of the variation, and the time that needs is thermal response time, denoted as t0.5. The experimental medium is usually water.

公称压力Nominal pressure

一般是指在常温下保护管所能承受的静态外压力而不破损、泄露。允许工作压力不仅与温度、保护管材料、直径、壁厚等有关，还与其结构形式、安装方法、插入深度以及被测介质种类和流速等有关。

It ussally indicates the static external pressure the protection tube is capable of bearing under the room temperature while the protection

tube does not break or leak. In fact, the safe working pressure is not only related to temperature, materials of protection tube and wall thickness and diameter, but also related to structural configuration, assembling method, placed depth, medium type and flow rate to be measured.

### 热电阻最小置入深度

一般不小于100mm（特殊产品除外）。

The minimum placed depth of thermal resistance shall be not less than 100mm (except the special products).

### 热电阻绝缘电阻Insulation resistance of thermal resistance

常温绝缘电阻值的试验电压可取直流10~100V任意值。环境温度在15~35℃范围内，相对湿度应不大于80%，铂热电阻的常温绝缘电阻值应不小于100MΩ。铜热电阻的常温绝缘电阻应不小于50 MΩ。

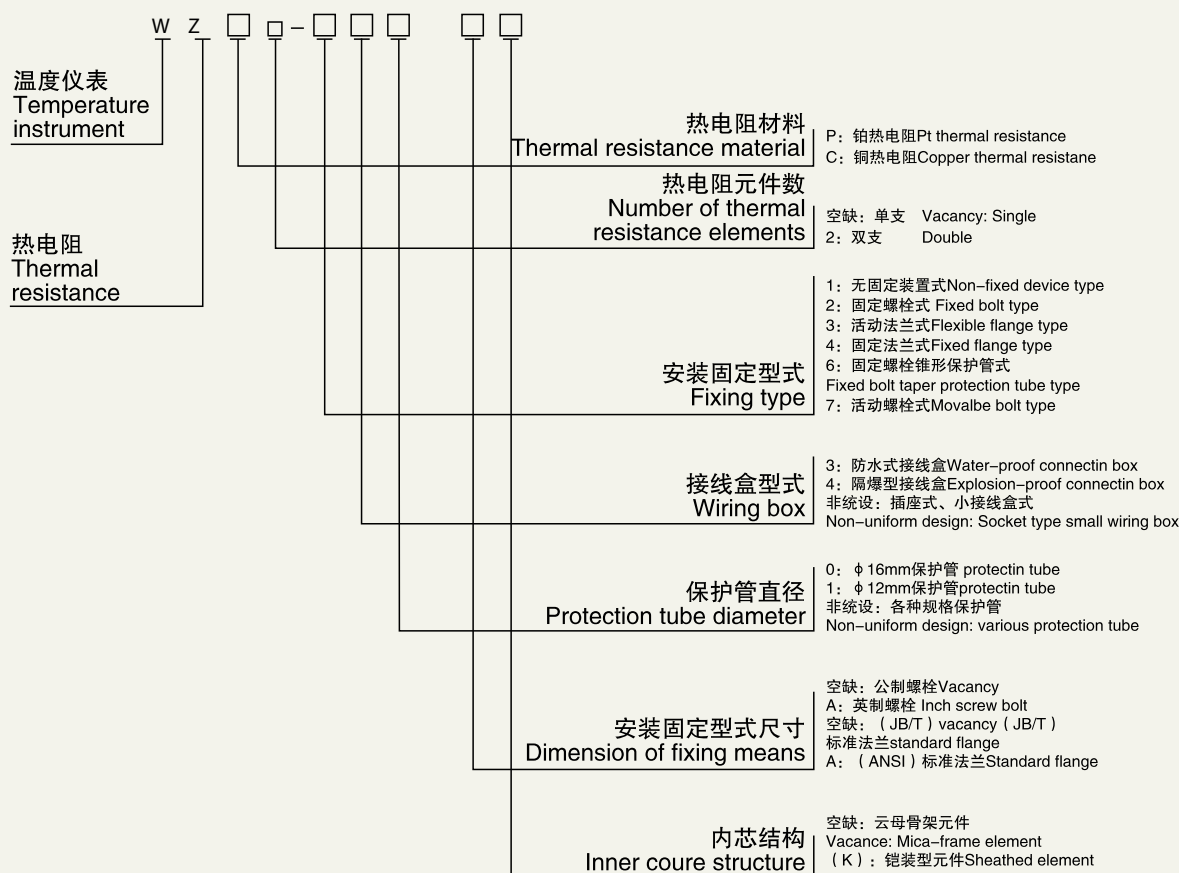
The experimental voltage of insulation resistance at normal temperature can be selected from any value from DC 10V to 100V. The normal-temperature insulation resistance of Pt thermal resistance shall not less than 100MΩ, if the ambient temperature is within the range of 15~35℃ and the relative humidity is not more than 80%, while that of the copper thermal resistance shall not less than 50 MΩ.

### 自然影响Natural influence

热电阻允许通过的最大测量电流为2~5mA（根据不同元件），由此产生的温升不大于0.3℃。

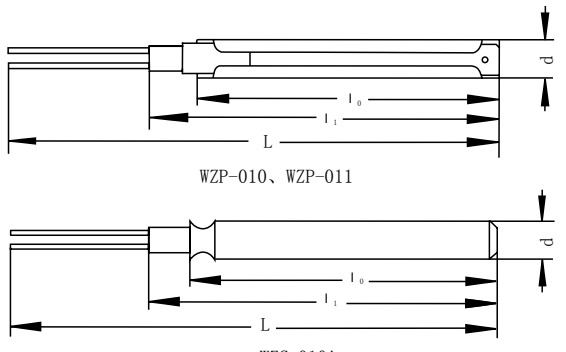
the maximum measuring current that is permissible to pass through the thermal resistance is 2~5mA( depending on different elements), from which, the temperature rise arose shall not exceed 0.3℃.

## 型号命名Type designation



热电阻感温元件Temperature-sensing element of thermal resistance

(图43 Fig 43)

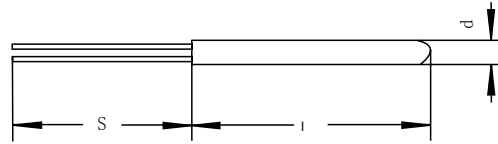
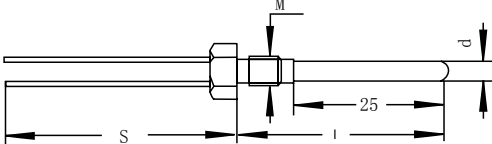
型号Type	分度号 Graduation mark	测量范围 Measuring range (℃)	热响应时间 Thermal response time $\tau$ 0.5(s)	规格Specification				
				d	L	$l_0$	$l_1$	
WZP-010 WZP <sub>2</sub> -010	Pt100	-200~+420	≤60	Φ12	300 900 350 1150 450 1400 550 1650 650 2150	85	105	WZP-010、WZP-011
WZP-011 WZP <sub>2</sub> -011			≤30	Φ8	300 900 350 1150 450 1400 550 1650 650 2150	65	80	
WZC-010A	Cu50	-50~+100	≤90			90	105	WZC-010A

注：（1）可作为普通型铂热电阻的内芯进行更换。（2）WZP-010、011为元母骨架元件。（3）WZC-010为铜电阻元件。

Note: (1) It can be changed with the inner core of conventional type platinum thermocouple. (2) WZP-010 and 011 are skeleton elements. (3) WZC-010 is copper resistance element.

铂电阻元件Pt resistance element

(图44 Fig 44)

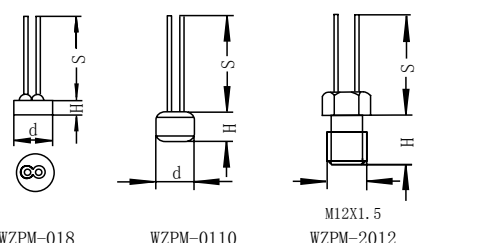
型号Type	分度号 Graduation mark	热响应时间Thermal response time τ 0.5 (s)	保护管材料 Protection tube material	规格 (mm) Specification			
				d	l	s	
WZP-011S	Pt100	≤0.15	陶瓷Pottery	Φ 1.2	20	10	WZP-011S、WZP-012S、WZP-013S、WZP-014S、WZP-015S
WZP-012S		≤0.2		Φ 1.6	25	15	
WZP-013S		≤2	1Cr18Ni9Ti	Φ 3	32	200	
WZP-014S		≤0.5	陶瓷Pottery	Φ 3.2	25	15	
WZP-015S		≤5	1Cr18Ni9Ti	Φ 5	32	200	
WZP-203S				Φ 3	35		
WZP-205S				Φ 5			

注：WZP-203螺栓为M6、WZP-205螺栓为M8、S为进口元件。

Note: WZP-230S bolt is M6, WZP-250 bolt is M8 and S indicates imported elements.



端面型热电阻元件End-face thermal resistance element

(图45 Fig 45)

型号Type	分度号 Graduation mark	测量范围 Measuring range (℃)	热响应时间 Thermal response time $\tau$ 0.5(s)	保护管材料 Protection tube material	规格 (mm) Specification			
					d	H	S	
WZPM-018	Pt100	-200~+500	≤0.5	陶瓷Pottery	Φ8	2	15	WZPM-018
WZPM-0110		-50~+150	≤5	1Cr18Ni9Ti	Φ10	8	200	WZPM-0110
WZPM-2012			≤10		M	10	200	M12X1.5 WZPM-2012

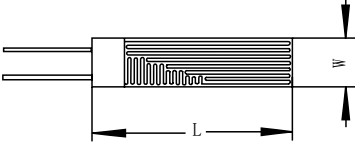
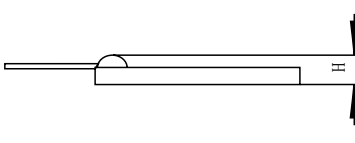
薄膜型铂热电阻元件Thin-film Pt thermal resistance element

(图46 Fig 46)

型号Type	分度号 Graduation mark	测量范围 Measuring range (℃)	规格 (mm) Specification				
WZP-2105	Pt 100	-50~+500	L	W	H	WZP-2105、WZP-2108	WZP-2105M
WZP-2108			2.3	2	1.3		
WZP-2105M			1.6	1.25	1.1		
			2.3	2	1.4		

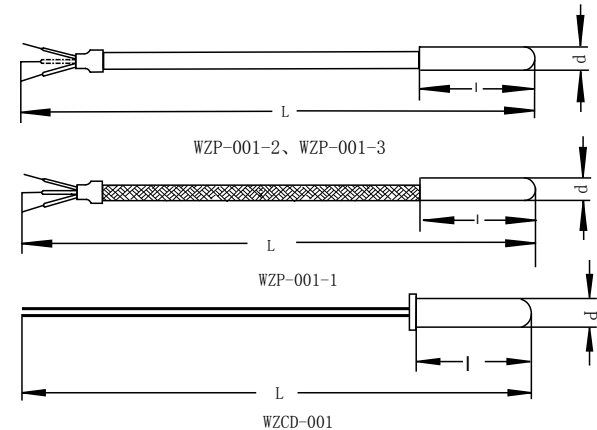
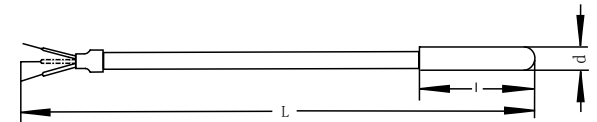
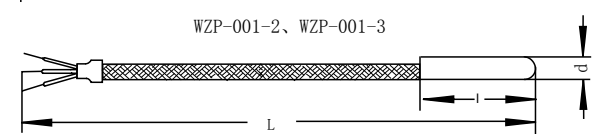

厚膜型铂热电阻元件 Thick-film Pt thermal resistance element

(图47 Fig 47)

型号Type	分度号 Graduation mark	测量范围 Measuring range (°C)	规格 (mm) Specification			
	Pt 100 (Pt 500) (Pt1000)	-50~+500 (-50~+400)	L	W	H	
WZP-08A			25	3.2	1.8	
WZP-08B			15	2	1.5	

金属护套铂热电阻元件 Metallic sheath Pt thermal resistance element

(图48 Fig 48)

型号Type	分度号 Graduation mark	测量范围 Measuring range (°C)	热响应时间 Thermal response time $\tau \leq 0.5(s)$	保护管材料 Protection tube material	规格规格 Specification			
					d	L	l	
WZP-001-1 WZP <sub>2</sub> -001-1	Pt100	-70~+400	≤5	1Cr18Ni9Ti		500	10	
WZP-001-2 WZP <sub>2</sub> -001-2						1000	20	
WZP-001-3 WZP <sub>2</sub> -001-3					Φ3	1500	25	
WZP-001-4 WZP <sub>2</sub> -001-4					Φ4	2000	30	
					Φ5	2500	40	
					Φ6	3000	50	
					Φ8	3500	80	
						4000	100	
WZCD-001-1 WZCD-001-2 WZCD-001-3 WZCD-001-4	CU50	-50~+100	≤30	T2				

注：（1）主要用于推力瓦温度测量。

（2）型号后加-1 为三线制带屏蔽导线，型号后加-2为二线制无屏蔽带耐油护套导线；型号后加-3为三线制无屏蔽带耐油护套导线，型号后加-4为三线制带屏蔽、耐油护套导线、引出线类型可根据用户要求选定。

（3）引出线长度超过5m为四线制。

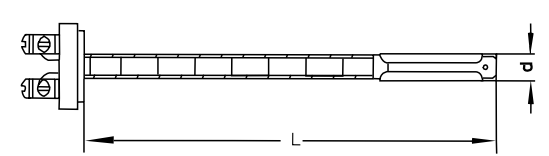
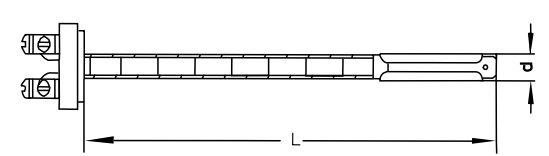
Note: (1) They are mainly used to measure the temperature for thrust block.

(2) The type with -1 is three-wire system shielded conductor, and that with -2 is two-wire system unshielded conductor with oil-proof sheath, and that with -3 is three-wire system unshielded conductor with oil-proof sheath and that with -4 is three-wire system shielded conductor with oil-proof sheath. The type for leading-out wire can be selected as the users required.

(3) The leading-out wire over 5m is four-wire system.

简易式铂热电阻元件（带瓷接线板） Simple Pt thermal resistance element (with magnetic terminal block)

(图49 Fig 49)

型号Type	分度号 Graduation mark	测量范围 Measuring range (°C)	热响应时间 Thermal response time $\tau \leq 0.5(s)$	骨架材料 Frame material	规格 (mm) Specification		
					d	L	
WZP-010 WZP <sub>2</sub> -010	PT100	-200~+420	≤60	云母mica	Φ12	280~2180	
WZP-011 WZP <sub>2</sub> -011			≤30		Φ8		

注：（1）主要用于装配式铂热电阻内芯更换。其长度正确选用应为外保护管总长度“L”再增加30mm。例：外保护管L=900mm，其内芯长度应为：930mm。

（2）接线端子规格参见89页，图140。

（3）L可根据用户需求选定。

Note: (1) The length selected shall be the overall length “L” of the outer protecting tube plus 30mm. For example: if the outer protecting tube L= 900mm, then its inner core shall be 930mm. instance.

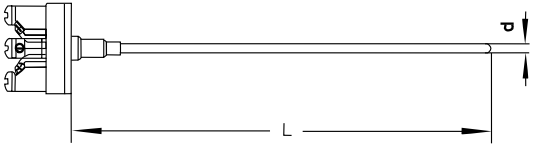
(2) The specification of the connection terminal can be referred to page 89, Fig 140.

(3) L can be chosen as the users required.

简易式铠装铂热电阻元件（带瓷接线板）

Simple sheathed Pt thermal resistance element (with magnetic terminal block)

(图50 Fig 50)

型号Type	分度号 Graduation mark	测量范围 Measuring range (℃)	热响应时间 Thermal response time $\tau$ 0.5 (s)	保护管材质 Protection tube material	规格 (mm) Specification		
					d	L	
WZPK-103	Pt100	-70~+600	$\leq 3$	1Cr18Ni9Ti	$\phi 3$	280~2180	
WZPK-104 WZPK <sub>2</sub> -104			$\leq 5$		$\phi 4$		
WZPK-105 WZPK <sub>2</sub> -105			$\leq 8$		$\phi 5$		
WZPK-106 WZPK <sub>2</sub> -106			$\leq 12$		$\phi 6$		

- 注：（1）用于装配式铠装铂热电阻内芯更换。  
（2）接线端子规格参见89页，图140。  
（3）L可根据用户需求选定。
- Note: (1) They are mainly used to replace the inner core of sheathed Pt thermal resistance.  
(2) The specification of the connection terminal can be referred to page 89, Fig 140.  
(3) L can be chosen as the users required.

热电阻保护管直径和长度规格

Diameter and length specification of thermal resistance protection tube

(表20 Table 20)

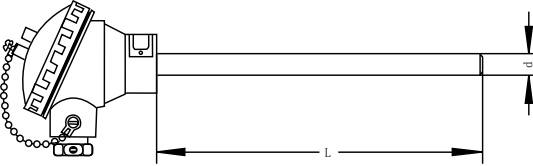
d (mm) $\phi 12$	总长L (mm) Overall length	225	250	300	350	400	450	550	650	900	1150	1400	1650
	置入深度l (mm) Placed depth	75	100	150	200	250	300	400	500	750	1000	1250	1500

d (mm) $\phi 16$	总长L (mm) Overall length	225	250	300	350	400	450	550	650	900	1150	1400	1650	2150
	置入深度l (mm) Placed depth	75	100	150	200	250	300	400	500	750	1000	1250	1500	2000

结构型式Structural shape

无固定装置式热电阻Non-fixed device thermal resistance

(图51 Fig 51)

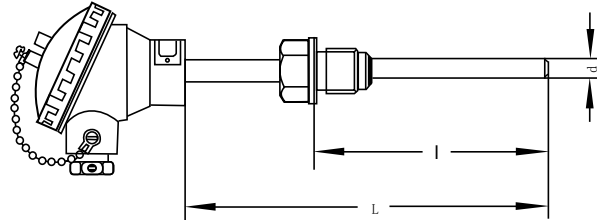
型号Type	分度号 Graduation mark	测量范围 Measuring range (℃)	热响应时间 Thermal response time $\tau$ 0.5 (s)	保护管材料 Protection tube material	d (mm)	
WZP-130 WZP <sub>2</sub> -130	Pt100	-200~+420	$\leq 90$	1Cr18Ni9Ti	$\phi 16$	
WZP-130 (K) WZP <sub>2</sub> -130 (K)		-70~+600	$\leq 45$		$\phi 16$	
WZP-131 WZP <sub>2</sub> -131		-200~+420	$\leq 60$		$\phi 12$	
WZP-131 (K) WZP <sub>2</sub> -131 (K)		-70~+600	$\leq 30$		$\phi 12$	
WZC-130 WZC-130 (K)	Cu50	-50~+100	$\leq 120$			

- 注：（1）型号后加（K），内芯为铠装元件。  
（2）热电阻保护管直径和长度规格参见38页，表20。
- Note: (1) Of the type immediately followed with (K), the inner core is sheathed element.  
(2) Refer to page 38, Fig 20 for the diameter and length of the thermal resistance protection tube.



固定螺栓式热电阻 Fixed bolt thermal resistance

(图52 Fig 52)

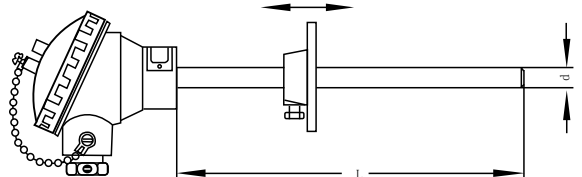
型号 Type	分度号 Graduation mark	测量范围 Measuring range (℃)	热响应时 间Thermal response time $\tau$ 0.5 (s)	保护管材料 Protection tube material	d (mm)			
WZP-230 WZP <sub>2</sub> -230	Pt100	-200~+420	$\leq 90$	1Cr18Ni9Ti	$\phi 16$			
WZP-230A WZP <sub>2</sub> -230A								
WZP-230 (K) WZP <sub>2</sub> -230 (K)		-70~+600	$\leq 45$					
WZP-231 WZP <sub>2</sub> -231		-200~+420	$\leq 60$					
WZP-231A WZP <sub>2</sub> -231A								
WZP-231 (K) WZP <sub>2</sub> -231 (K)	-70~+600	$\leq 30$						
WZC-230 WZC-230A WZC-230 (k)	Cu50	-50~+100	$\leq 120$					

- 注：（1）公称压力：10Mpa。  
（2）型号后加（K），内芯为铠装元件。  
（3）型号后加A为英制G3/4螺栓。  
（4）选用英制G3/4螺栓，内芯为铠装元件。例：WZP-230A(K)  
（5）直形保护管的固定螺栓规格参见91页，图147。

- Note: (1) Nominal pressure: 10Mpa  
(2) Of the type immediately followed with (K), the inner core is sheathed element.  
(3) Of the type immediately followed with A, it is the British system G3/4 bolt.  
(4) Those that are of British system G3/4 bolt and have sheathed element as the inner core shall be selected. For example: WZP-230A (K).  
(5) Refer to page 91, Fig 147 for the fixed bolt specification of straight protection tube.

活动法兰式热电阻 Flexible flange thermal resistance

(图53 Fig 53)

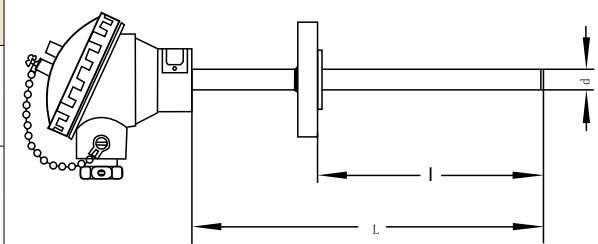
型号Type	分度号 Graduation mark	测量范围 Measuring range (℃)	热响应时间Thermal response time τ 0.5(s)	保护管材料 Protection tube material	d (mm)	
WZP-330 WZP <sub>2</sub> -330	Pt100	-200~+420	≤90	1Cr18Ni9Ti	Φ 16	
WZP-330 (K) WZP <sub>2</sub> -330 (K)		-70~+600	≤45			
WZP-331 WZP <sub>2</sub> -331		-200~+420	≤60		Φ 12	
WZP-331 (K) WZP <sub>2</sub> -331 (K)		-70~+600	≤30			
WZC-330 WZC-330 (K)	Cu50	-50~+100	≤120			

- 注：（1）公称压力为常压。  
（2）型号后加（K），内芯为铠装元件。  
（3）活动法兰规格参见92页，图151。

- Note: (1) Nominal pressure is the normal pressure.  
(2) Of the type immediately followed with (K), the inner core is sheathed element.  
(3) Refer to page 92, Fig 151 for specification of the flexible flange.

固定法兰式热电阻Fixed flange thermal resistance

(图54 Fig 54)

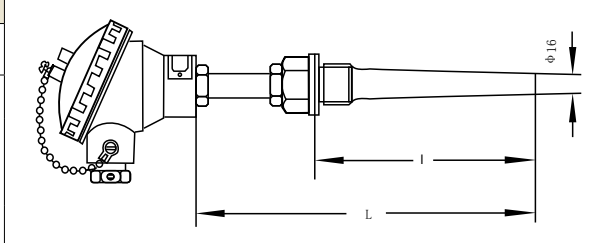
型号Type	分度号 Graduation mark	测量范围 Measuring range (°C)	热响应时间 Thermal response time $\tau$ 0.5(s)	保护管材料 Protection tube material	d (mm)	
WZP-430 WZP <sub>2</sub> -430	Pt100	-200~+420	$\leq 90$	1Cr18Ni9Ti	$\phi 16$	
WZP-430 (K) WZP <sub>2</sub> -430 (K)		-70~+600	$\leq 45$		$\phi 16$	
WZP-431 WZP <sub>2</sub> -431		-200~+420	$\leq 60$		$\phi 12$	
WZP-431 (K) WZP <sub>2</sub> -431 (K)		-70~+600	$\leq 30$		$\phi 12$	
WZC-430 (K) WZC <sub>2</sub> -430 (K)	Cu50	-50~+100	$\leq 120$			

- 注：（1）公称压力：2.5Mpa。  
 （2）型号后加A，为ANSI标准法兰。例：WZP-430A。选用JB/T标准法兰参见92页，图150。  
 （3）型号后加（K）内芯为铠装元件。  
 （4）热电阻保护管直径和长度规格参见38页，表20。

- Note: (1) Nominal pressure: 2.5Mpa.  
 (2) The type immediately followed with A is ANSI standard flange, for example, WZP-430A. Refer to page 92, Fig 150 to select the JB/T standard flange.  
 (3) Of the type immediately followed with (K), the inner core is sheathed element.  
 (4) Refer to page 38, Fig 20 for the diameter and length of the thermal resistance protection tube.

固定螺栓锥形保护管式铂热电阻Fixed bolt taper protection tube Pt thermal resistance

(图55 Fig 55)

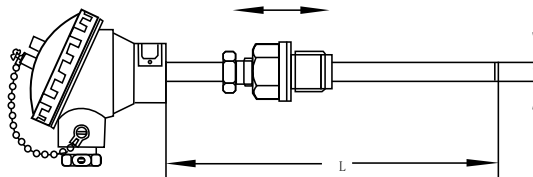
型号Type	分度号 Graduation mark	测量范围 Measuring range (°C)	热响应时间 Thermal response time $\tau$ 0.5(s)	保护管材料 Protection tube material	规格 Specification (mm)	
WZP-630 (K) WZP <sub>2</sub> -630 (K)	Pt100	-70~+600	$\leq 60$	1Cr18Ni9Ti	L×l	
WZP-630A (K) WZP <sub>2</sub> -630A (K)					250×100 300×150 350×200 400×250 450×300 500×350 550×400 600×450 650×500	
WZP-631B (K) WZP <sub>2</sub> -631B (K)						

- 注：（1）公称压力：30 Mpa。流速 $\leq 80\text{m/s}$ 。  
 （2）型号后加（K），内芯为铠装元件。例：WZP-630 (K)  
 （3）选用英制G1”螺栓，内芯为铠装元件，应在型号后加A (K)。例：WZP-630A (K)  
 （4）选用齿形垫片，应在型号后加B，例：WRN-630B (K)。齿形垫片规格参见93页，图152。  
 （5）锥形保护管固定螺栓参见92页，图148。

- Note: (1) Nominal pressure: 30 Mpa. Flow rate $\leq 80\text{m/s}$ .  
 (2) Of the type immediately followed with (K), the inner core is sheathed element. Fox example, wzp-630 (K)  
 (3) Those that are of British system G1 bolt and have sheathed element as the inner core shall be added A (K) after the type when are selected. For example: WZP-630A (K) .  
 (4) Grooved metal gasket that is selected shall mark B behind the type, for example, WRN-630B (K). Refer to page 93, Fig 152, for the specification of grooved metal gasket.  
 (5) Refer to page 92, Fig 148 for taper protection tube fixed bolt.

活动螺栓式铂热电阻 Movable bolt Pt thermal resistance

(图56 Fig 56)

型号Type	分度号 Graduation mark	测量范围Measuring range (°C)	热响应时间Thermal response time $\tau \leq 0.5(s)$	保护管材料 Protection tube material	d(mm)	
WZP-730 WZP <sub>2</sub> -730	Pt100	-200~+420	$\leq 90$	1Cr18Ni9Ti	$\phi 16$	
WZP-730 (K) WZP <sub>2</sub> -730 (K)		-70~+600	$\leq 45$		$\phi 16$	
WZP-731 WZP <sub>2</sub> -731		-200~+420	$\leq 60$		$\phi 12$	
WZP-731 (K) WZP <sub>2</sub> -731 (K)		-70~+600	$\leq 30$		$\phi 12$	

注: (1) 公称压力为常压。

(2) 型号后加(K), 内芯为铠装元件。

(3) 热电阻保护管直径和长度规格参见38页, 表20。

(4) 直形保护管的固定螺栓规格参见91页, 图147。

Note: (1) The nominal pressure is normal pressure.

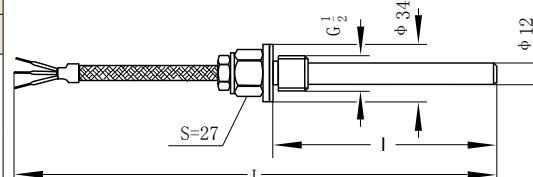
(2) Of the type immediately followed with (K), the inner core is sheathed element.

(3) Refer to page 38, Fig 20 for the diameter and length specification of the thermal resistance protection tube.

(4) Refer to page 91, Fig 147 for the specification of the fixed bolt of straight protection tube.

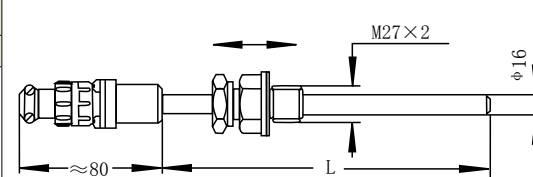
固定螺栓带导线式热电阻 Fixed bolt lead thermal resistance

(图57 Fig 57)

型号Type	分度号 Graduation mark	测量范围 Measuring range (°C)	热响应时间 Thermal response time $\tau \leq 0.5(s)$	保护管材料 Protection tube material	规格 Specification (mm)	
					L×I	
WZP-200 (K)	Pt100	-70~+400	$\leq 30$	1Cr18Ni9Ti	500×100 550×150 600×200 700×300 900×400	
WZP <sub>2</sub> -200 (K)			$\leq 45$			
WZC-200 (K)	Cu50	-50~+100	$\leq 120$			

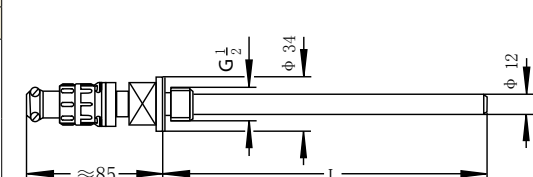
可动螺栓表面式铂热电阻 Movable bolt surface platinum thermistor resistance

(图58 Fig 58)

型号Type	分度号 Graduation mark	测量范围 Measuring range (°C)	热响应时间 Thermal response time $\tau \leq 0.5(s)$	保护管材料 Protection tube material	规格 Specification (mm)	
					L	
WZPM-267	Pt100	-70~+400	$\leq 30$	1Cr18Ni9Ti	100 150 200 250 300 350	
WZPM <sub>2</sub> -267						

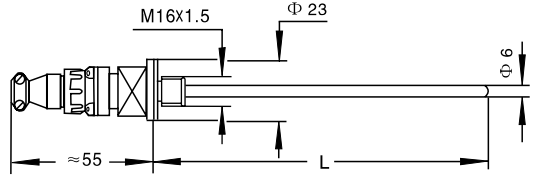
管螺栓固定螺栓插座式热电阻 Pipe bolt fixed bolt socket thermal resistance

(图59 Fig 59)

型号Type	分度号 Graduation mark	测量范围 Measuring range (°C)	热响应时间 Thermal response time $\tau \leq 0.5(s)$	保护管材料 Protection tube material	规格 Specification (mm)	
					L	
WZP-269	Pt100	-200~+420	$\leq 30$	1Cr18Ni9Ti	75 100 150 200 250	
WZP <sub>2</sub> -269			$\leq 45$			
WZC-269	Cu50	-50~+100	$\leq 120$			

固定螺栓插座式铂热电阻Fixed bolt socket platinum thermal resistance

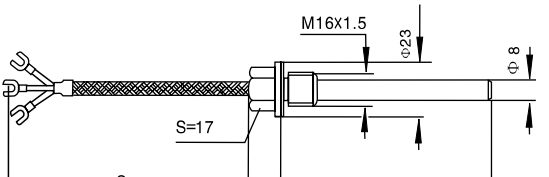
(图60 Fig 60)

型号Type	分度号 Graduation mark	测量范围 Measuring range (℃)	热响应时间 Thermal response time τ 0.5(s)	保护管材料 Protection tube material	规格Specification (mm)				
					L				
WZP-270	Pt100	-70~+400	≤15	1Cr18Ni9Ti	40				
WZP <sub>2</sub> -270			≤30		50				
					75				
					100				
					150				

固定螺栓带导线式铂热电阻（汽机专用）

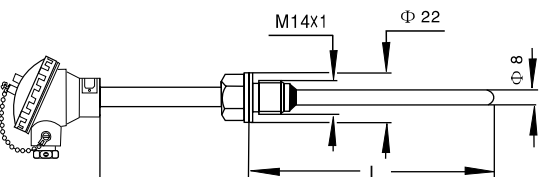
Fixed bolt lead platinum thermal resistance(special for steam machine)

(图61 Fig 61)

型号Type	分度号 Graduation mark	测量范围 Measuring range (°C)	热响应时间Thermal response time $\tau$ 0.5(s)	保护管材料 Protection tube material	规格Specification (mm)		
					L	S	
WZP-SQ1	Pt100	0~100	≤15	1Cr18Ni9Ti	75	2000	
WZP <sub>2</sub> -SQ1			≤30				

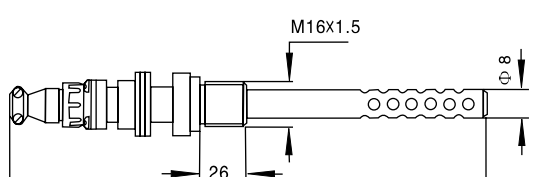
固定螺栓式铂热电阻Fixed bolt platinum thermal resistance

(图62 Fig 62)

型号Type	分度号 Graduation mark	测量范围 Measuring range (°C)	热响应时间Thermal response time $\tau$ 0.5(s)	保护管材料 Protection tube material	规格 Specification (mm)	
					L x I	
WZP-280	Pt100	-70~+400	≤30	1Cr18Ni9Ti	175×75	
WZP <sub>2</sub> -280			≤45		200×100	
					250×150	
					300×200	
					350×250	

固定螺栓式（蜂窝状）铂热电阻Fixed bolt(honeycomb) platinum thermal resistance

(图63 Fig 63)

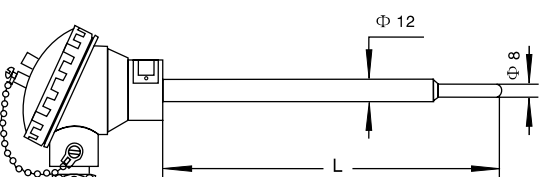
型号Type	分度号 Graduation mark	测量范围 Measuring range (°C)	热响应时间Thermal response time $\tau$ 0.5(s)	保护管材料 Protection tube material	L(mm)	
WZP-26S	PT100	-70~+400	≤5	1Cr18Ni9Ti	50 75 100 125 150	

注：WZP-26S型用于测量流动气体和液体的温度。

Note: WZP-26S type is used to measure the temperature of floating gas and liquid.

无固定装置变径式铂热电阻Non-fixed device variable diameter platinum resistance

(图64 Fig 64)

型号Type	分度号Graduation mark	测量范围Measuring range (°C)	热响应时间Thermal response time $\tau$ 0.5(s)	保护管材料 Protection tube material	
WZP-1312 WZP <sub>2</sub> -1312	Pt100	-70~+600	≤30	1Cr18Ni9Ti	

注：（1）内芯为铠装元件。

（2）热电阻保护管直径和长度规格参见38页，表20。

Note: (1) The inner core is sheathed element.

(2) Refer to page 38, Fig 20 for the diameter and length specification of the thermal resistance protection tube.

### 固定螺栓变径式铂热电阻 Fixed bolt variable diameter platinum thermal resistance

(图65 Fig 65)

型号Type	分度号 Graduation mark	测量范围 Measuring range (°C)	热响应时间 Thermal response time $\tau$ 0.5(s)	保护管材料 Protection tube material	
WZP-2312 WZP <sub>2</sub> -2312	Pt100	- 70~+600	≤30	1Cr18Ni9Ti	
WZP-2312A WZP <sub>2</sub> -2312A					

注：（1）内芯均为铠装元件。（2）直形保护管的固定螺栓规格参见91页，图147。

（3）选用英制G3/4"螺栓，型号后加A。例：WZP-2312A。

（4）热电阻保护管直径和长度规格参见38页，表20。

Note: (1) All the inner cores are sheathed elements.

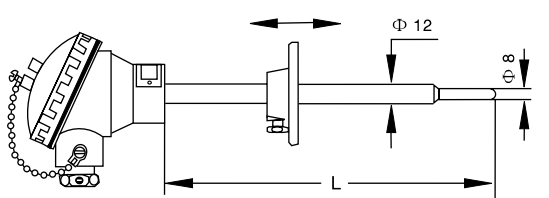
(2) Refer to page 91, Fig 147 for the specification of fixed bolt of the straight protection tube.

(3) The British system G3/4" bolt shall have A added after the type when being selected. For example, WZP-2312A.

(4) Refer to page 38, Table 20 for diameter and length specification of thermal resistance protection tube.

### 活动法兰变径式铂热电阻 Flexible flange variable diameter platinum thermal resistance

(图66 Fig 66)

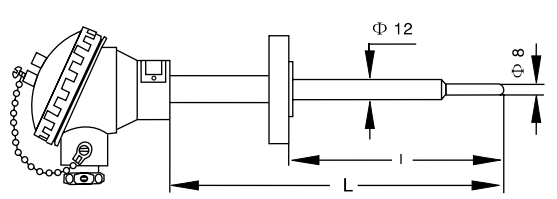
型号Type	分度号Graduation mark	测量范围 Measuring range (°C)	热响应时间Thermal response time $\tau$ 0.5(s)	保护管材料 Protection tube material	
WZP-3312 WZP <sub>2</sub> -3312	Pt100	- 70~+600	≤30	1Cr18Ni9Ti	

注：（1）内芯均为铠装元件。（2）活动法兰规格参见92页，图151。（3）热电阻保护管直径和长度规格参见38页，表20。

Note: (1) All the inner cores are sheathed element. (2) Refer to page 92, Fig 151 for flexible flange specification. (3) Refer to page 38, Fig 20 for diameter and length specification of thermal resistance protection tube.

### 固定法兰变径式铂热电阻 Fixed flange variable diameter platinum thermal resistance

(图67 Fig 67)

型号Type	分度号Graduation mark	测量范围 Measuring range (°C)	热响应时间Thermal response time $\tau$ 0.5(s)	保护管材料 Protection tube material	
WZP-4312 WZP <sub>2</sub> -4312	Pt100	- 70~+600	≤30	1Cr18Ni9Ti	

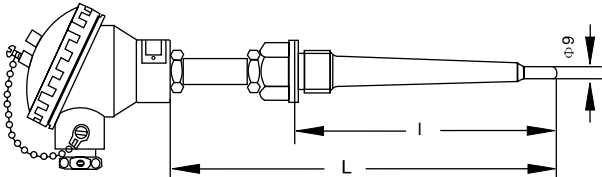
注：（1）公称压力为：2.5Mpa。（2）内芯均为铠装元件。（3）型号后加A，为ANSI标准法兰。例：WZP-4312A。选用JB/T标准法兰参见92页，图150。（4）热电阻保护管直径和长度规格参见38页，表20。

Note: (1) Nominal pressure: 2.5Mpa. (2) All the inner cores are sheathed element. (3) The type immediately followed with A is ANSI standard flange, for example, WZP-4312A. Refer to page 92, Fig 150 to select the JB/T standard flange. (4) Refer to page 38, Table 20 for diameter and length specification of thermal resistance protection tube.

固定螺栓锥形保护管变径式铂热电阻

Fixed bolt taper protectin tube variable diameter platinum thermal resistance

(图68 Fig 68)

型号Type	分度号 Graduation mark	测量范围 Measuring range (°C)	热响应时间Thermal response time $\tau \leq 0.5(s)$	规格Specification	
				L x l	
WZP-6309 WZP <sub>2</sub> -6309	Pt100	-70~+600	≤30	250×100	
WZP-6309A WZP <sub>2</sub> -6309A				300×150	
WZP-6309B WZP <sub>2</sub> -6309B				350×200	
				400×250	
				450×300	
				500×350	
				550×400	
				600×450	
				650×500	

- 注：（1）公称压力：30Mpa。流速：≤80m/s。  
（2）保护管材料：1Cr18Ni9Ti。  
（3）内芯均为铠装元件。  
（4）选用英制G1”螺栓，应在型号后加A，例：WZP-6309A。  
（5）型号后加B，为选配齿形垫片。齿形垫片规格参见93页，图152。  
（6）锥形保护管的固定螺栓规格参见92页，图148。

- Note: (1) Nominal pressure: 30 Mpa. Flow rate≤80m/s.  
(2) Protection tube material: 1Cr18Ni9Ti.  
(3) All the inner cores are sheathed elements.  
(4) Those that are of British system G1”bolt shall be added A after the type when being selected. For example: WZP-6309A.  
(5) Those with B behind are matching grooved metal gaskets, of which, the specification can be referred to page 93, Fig 152.  
(6) Refer to page 92, Fig 148 for fixed bolt specification of taper protection tube.



## 铠装铂热电阻

### Brief introduction to sheathed platinum thermal resistance

铠装铂热电阻是一种温度传感器，它比装配式铂电阻直径小，易弯曲，抗震性好，适宜安装在装配式铂电阻无法安装的地方。本公司生产的WZPK系列铠装铂电阻采用进口铂电阻测温元件，具有精确、灵敏、热响应时间快、质量稳定、使用寿命长等优点。

Sheathed platinum thermal resistance is a type of temperature sensor. Its diameter is less than that of packaged platinum resistance. Easy to bend and good in earthquake resistance, it is suitable to the places where the packaged platinum resistance cannot be fitted. The WZPK series sheathed platinum resistance produced by our company adopts the imported platinum resistance element for thermometry, having the advantages of accuracy, sensitiveness, short thermal response time, stable quality and long service life.

铠装铂热电阻外保护套采用不锈钢，管内充满高密度氧化物绝缘体，它具有很强的抗污染性能和优良的机械强度，适合安装在环境恶劣的场合。

The sheathed platinum thermal resistance has a strong anti pollution and fine mechanical strength and can be installed into places with bad environment condition for its outer protecting sleeve is made of stainless steel and the inside of its tube is filled with high density oxide insulator.

铠装热电阻可用于测量-70~600℃范围内温度，可直接用铜导线和二次仪表相连接使用。由于它具有良好的电阻输出特性，可为显示仪表、记录仪、调节器、扫描器、数据记录仪以及DCS系统提供精确的温度变化输出信号，符合JB/T8622-1997标准。

Sheathed thermal resistance can be used to measure the temperature within -70~600℃. It can also be made use of by connecting directly the copper conductor with secondary meter. With good electric output property, it can provide accurate output signal of temperature variation for display instrument, recorder, accommodator, scanner, data logger and computer. It shall comply with JB/T8622-1997 standard.



温度测量范围及允差 Temperature measurement range and tolerance (表21 Table 21)

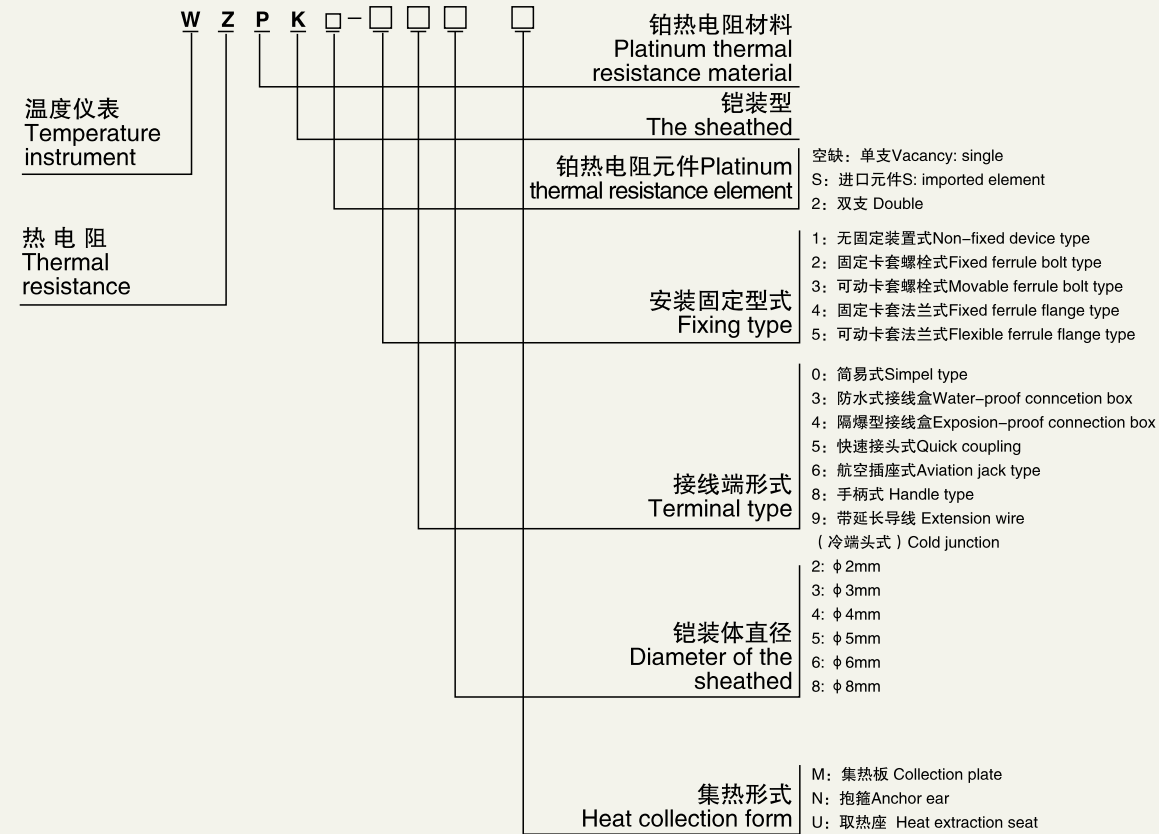
类型Type	分度号 Graduation mark	测量范围(℃) Measuring range	允许偏差Δt(℃) Tolerance
铂热电阻 Platinum thermal resistance	Pt100	-70~+600	A级: ±(0.15+0.002 t ) B级: ±(0.30+0.005 t )

铠装铂热电阻的热响应时间及可供长度 Thermal response time and available length of sheathed platinum thermal resistance (表22 Table 22)

d (mm)	热响应时间 τ 0.5(s)Thermal response time	保护管材料 Protection tube material	L (mm)
φ3	≤3	*1Cr18Ni9Ti	100 400 1000 4000 10000 150 450 1500 4500 12000 200 500 2000 5000 13000 250 650 2500 6000 14000 300 750 3000 7000 15000 350 900 3500 8000 20000
φ4	≤5		
φ5	≤8		
φ6	≤12		
φ8	≤18		

注: 铠装热电阻的测量端部分100mm内不能弯曲, 可绕半径不应小于铠装体直径的5倍。“\*” 常规供货为1Cr18Ni9Ti, 如需要其他材质另行注明。  
Note: The measuring terminal part of the sheathed thermal resistance shall not bend within 100mm, and the windable radius behind the former part shall not less than 5 times of the daimeter of the sheathed. The ordinary order is 1Cr18Ni9Ti. Pleaser mark it seperately if other material is required.

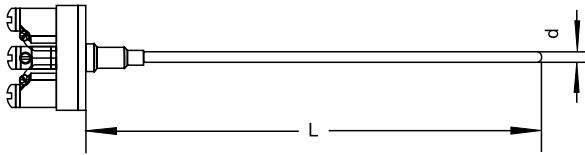
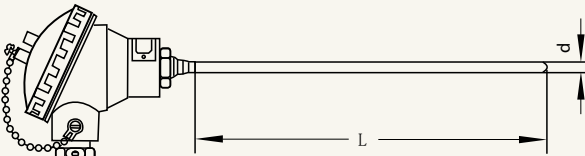
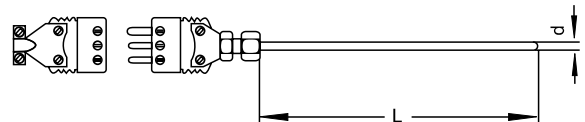
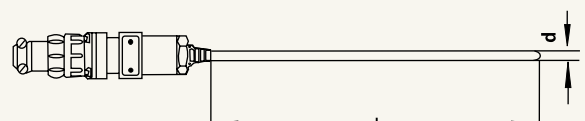
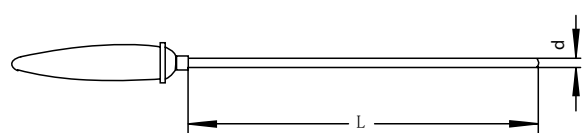
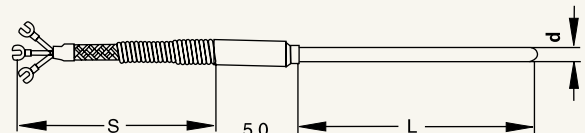
型号命名Type designation



## 结构型式Structure shape

无固定装置式铠装铂热电阻Non-fixed device sheathed platinum thermal resistance

(图69 Fig 69)

接线端型式Terminal type	型号Model	示意图Schematic diagram
简易式 Simple type	WZPK-10□S WZPK <sub>2</sub> -10□S	
防水式 Water-proof Type	WZPK-13□S WZPK <sub>2</sub> -13□S	
快速接头式 Quick coupling type	WZPK-15□S WZPK <sub>2</sub> -15□S	
航空插座式 Aviation jack type	WZPK-16□S WZPK <sub>2</sub> -16□S	
手柄式 Handle type	WZPK-18□S WZPK <sub>2</sub> -18□S	
带延长导线式 Extension wire	WZPK-19□S WZPK <sub>2</sub> -19□S	

注：(1) WZPK-10□S可用于装配式铂热电阻铠装元件更换。其长度的正确选用应为保护管总长度“L”再增加30mm。

(2) 带延长导线式，尾线常规附带500mm，如需增加请注明长度。

(3) 选择铠装热电阻的分度号、测量范围、热响应时间、直径、可供长度参见46页，表21、表22。

(4) 型号后加“S”为进口元件。

Note: (1) WZPK-10□S is applicable to replacement of sheathed elements of packaged platinum thermal resistance. Its length shall be the overall length “L” of the outer protecting tube plus 30mm.

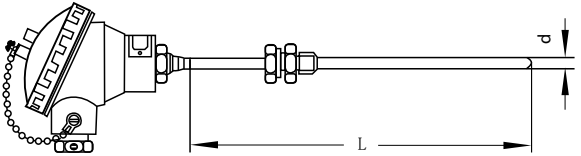
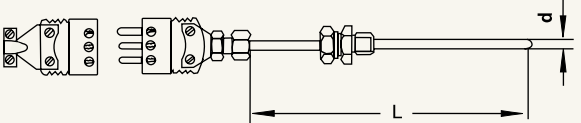
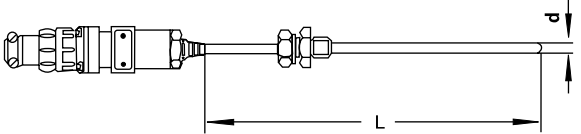
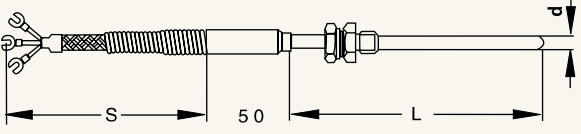
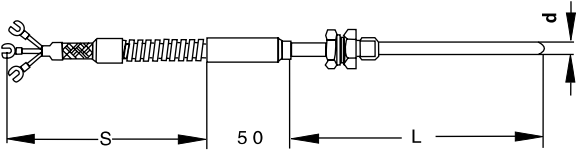
(2) Of the extension wire type, the buttcock line always is attached to 500mm. If it need to add, please indicate the length.

(3) Refer to page 46, Table 21 and 22 to select the graduation mark, measuring range, thermal response time, diameter and available length of the sheathed thermal resistance.

(4) The type with a “S” attached to is imported element.

卡套螺栓式铠装铂热电阻Ferrule bolt sheathed platinum thermal resistance

(图70 Fig 70)

接线端型式Terminal type	型号Model	示意图Schematic diagram
防水式 Water-proof Type	WZPK-23□S WZPK <sub>2</sub> -23□S WZPK-33□S WZPK <sub>2</sub> -33□S	
快速接头式 Quick coupling type	WZPK-25□S WZPK <sub>2</sub> -25□S WZPK-35□S WZPK <sub>2</sub> -35□S	
航空插座式 Aviation jack type	WZPK-26□S WZPK <sub>2</sub> -26□S WZPK-36□S WZPK <sub>2</sub> -36□S	
带延长导线式 Extension wire	WZPK-29□S WZPK <sub>2</sub> -29□S WZPK-39□S WZPK <sub>2</sub> -39□S	
带延长导线式 (不锈钢软管) Extension wire (stainless steel soft tube)	WZPK-29□SP3A WZPK <sub>2</sub> -29□SP3A WZPK-39□SP3A WZPK <sub>2</sub> -39□SP3A	

注：（1）铠装热电阻直径 $\geq \phi 5$ ，卡套螺栓的螺栓常规供货为M16 $\times$ 1.5； $\leq \phi 4$ 为M12 $\times$ 1.5。

（2）固定卡套螺栓公称压力：2.5Mpa。活动卡套螺栓公称压力为常压。

（3）卡套螺栓规格参见90页，图141。

（4）型号后加“S”为进口元件。

Note: (1) The diameter of sheathed thermal resistance is not less than  $\phi 5$ . The common shipment of ferrule bolt bolt is M16 $\times$ 1.5; and  $\leq \phi 4$  is M12 $\times$ 1.5.

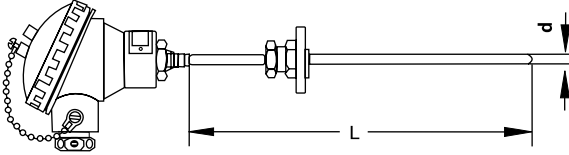
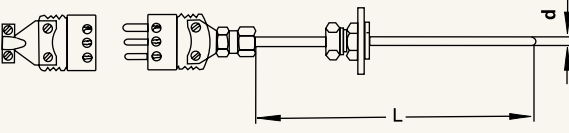
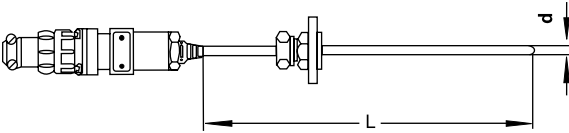
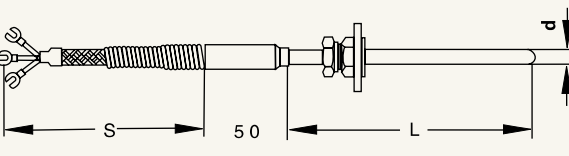
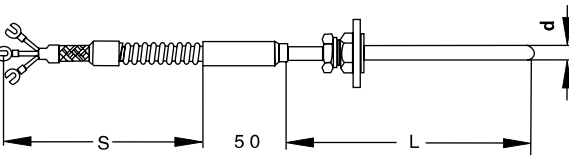
(2) The fixed ferrule bolt's nominal pressure is 2.5Mpa, while the movable ferrule bolt's nominal pressure is nominal pressure.

(3) Refer to page 90, Fig 141 for the specification of ferrule bolt.

(4) The type with a "S" attached to is imported element.

卡套法兰式铠装铂热电阻 Ferrule flange sheathed platinum thermal resistance

(图71 Fig 71)

接线端型式 Terminal type	型号 Model	示意图 Schematic diagram
防水式 Water-proof Type	WZPK-43□S WZPK <sub>2</sub> -43□S WZPK-53□S WZPK <sub>2</sub> -53□S	
快速接头式 Quick coupling type	WZPK-45□S WZPK <sub>2</sub> -45□S WZPK-55□S WZPK <sub>2</sub> -55□S	
航空插座式 Aviation jack type	WZPK-46□S WZPK <sub>2</sub> -46□S WZPK-56□S WZPK <sub>2</sub> -56□S	
带延长导线式 Extension wire	WZPK-49□S WZPK <sub>2</sub> -49□S WZPK-59□S WZPK <sub>2</sub> -59□S	
带延长导线式 (不锈钢软管) Extension wire (stainless steel soft tube)	WZPK-49□SP3A WZPK <sub>2</sub> -49□SP3A WZPK-59□SP3A WZPK <sub>2</sub> -59□SP3A	

注：（1）铠装热电阻直径 $\geq \phi 5$ ，卡套法兰盘常规供货为 $\phi 60$ ； $\leq \phi 4$ 为 $\phi 50$ 。

（2）固定卡套法兰公称压力：2.5Mpa。可动卡套螺栓公称压力为常压。（3）卡套法兰规格参见92页，图149。

（4）型号后加“S”为进口元件。

Note: (1) The diameter of sheathed thermal resistance is not less than  $\phi 5$ , The common shipment of ferrule flange is  $\phi 60$ ; and  $\leq \phi 4$  is  $\phi 50$ .

(2) The fixed ferrule flange's nominal pressure is 2.5Mpa, while the flexible ferrule flange's nominal pressure is nominal pressure.

(3) Refer to Page 92, Fig 149 for the specification of ferrule flange.

(4) The type with a "S" attached to is imported element.

端面热电阻、热电偶
End-face thermal resistance and end-face thermocouple

WZCM、WZPM型端面热电阻和WRNM、WREM型端面热电偶，与常规热电阻、热电偶相比，能更迅速、更准确的反应被测表面实际温度。适用于测量轴瓦或其它机体表面的温度。

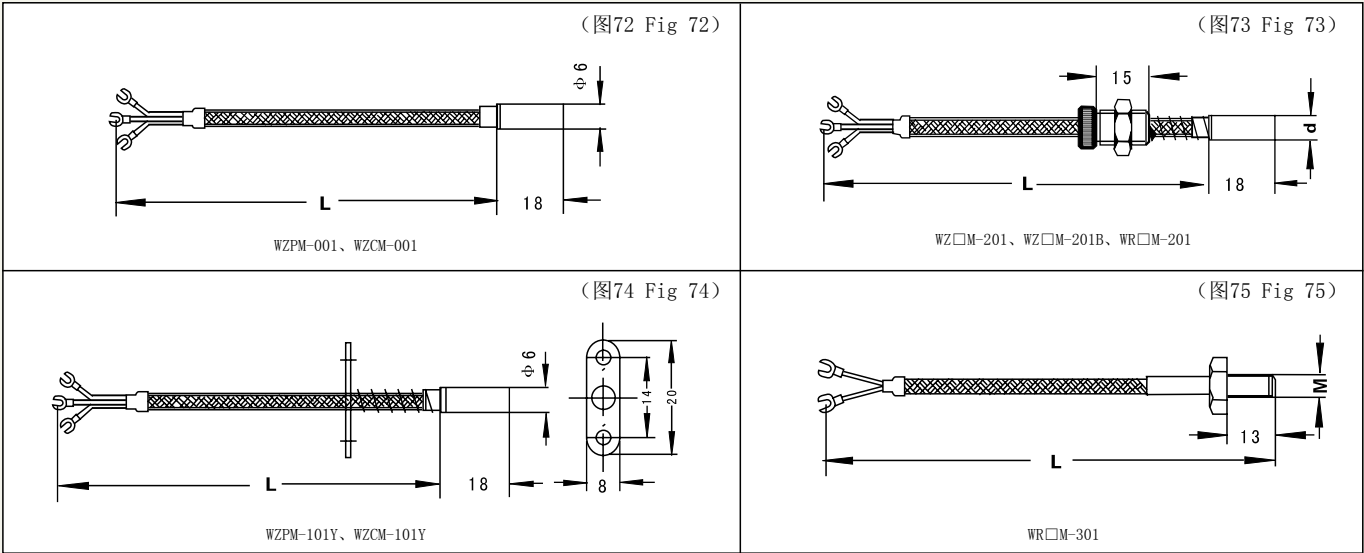
End-face thermal resistance of WZCM and WZPM type and end-face thermocouple of WRNM and WREM type, compared with the conventional thermal resistance and thermocouple, can reflect the true temperature of the surface to be detected both quickly and accurately. They are suitable to measure the surface temperature of bearing shell and other machines.

端面热电阻、热电偶End-face thermal resistance and end-face thermocouple (表23 Table 23)

型号Type	分度号Graduation mark	测量范围 Measuring range (℃)	热响应时间Thermal response time τ 0.5(s)	保护管材料 Protection tube material	L (mm)	允许偏差 Tolerance Δt(℃)	规格 Specification (mm)		
WZPM-001-1	Pt100	-70~+200	≤10	Cu	500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000	± (0.3+0.005 t )	d= φ 6		
WZCM-001 -1	Cu50	-50~+100	≤15			± (0.3+0.006 t )			
WZPM-201-2	Pt100	-70~+200	≤10			± (0.3+0.005 t )	d= φ 6	M8×0.75	
WZCM-201-2	Cu50	-50~+100	≤15			± (0.3+0.006 t )			
WZPM-201-3	Pt100	-70~+200	≤10			± (0.3+0.005 t )			
WZCM-201-3	Cu50	-50~+100	≤15			± (0.3+0.006 t )			
WRNM-201	K	0~200	≤5	1Cr18Ni9Ti		±2.5℃			
WREM-201	E	0~200							
WZPM-201	Pt100	-50~+200	≤10	Cu		± (0.3+0.005 t )	d= φ 8.7	M10×1	
WZCM-201	Cu50	-50~+100	≤15			± (0.3+0.006 t )			
WZPM-101-Y	Pt100	-70~+200	≤10	Cu		± (0.3+0.005 t )	d= φ 6	W=14 W=20 W=28	
WZCM-101-Y	Cu50	-50~+100	≤15			± (0.3+0.006 t )			
WRNM-301	K	0~400	≤5	1Cr18Ni9Ti		*±2.5℃or±0.0075 t		M6×1	
WREM-301	E								

注：（1）|t|为实测温度绝对值。（2）型号后加-1 为三线制带屏蔽导线，型号后加-2为二线制无屏蔽带耐油护套导线；型号后加-3为三线制无屏蔽带耐油护套导线，型号后加-4为三线制带屏蔽、耐油护套导线。引出线类型可根据用户要求选定。（3）热电阻引出线超出5m选用四线制。（4）“\*”表示允许偏差两者中取其大者。

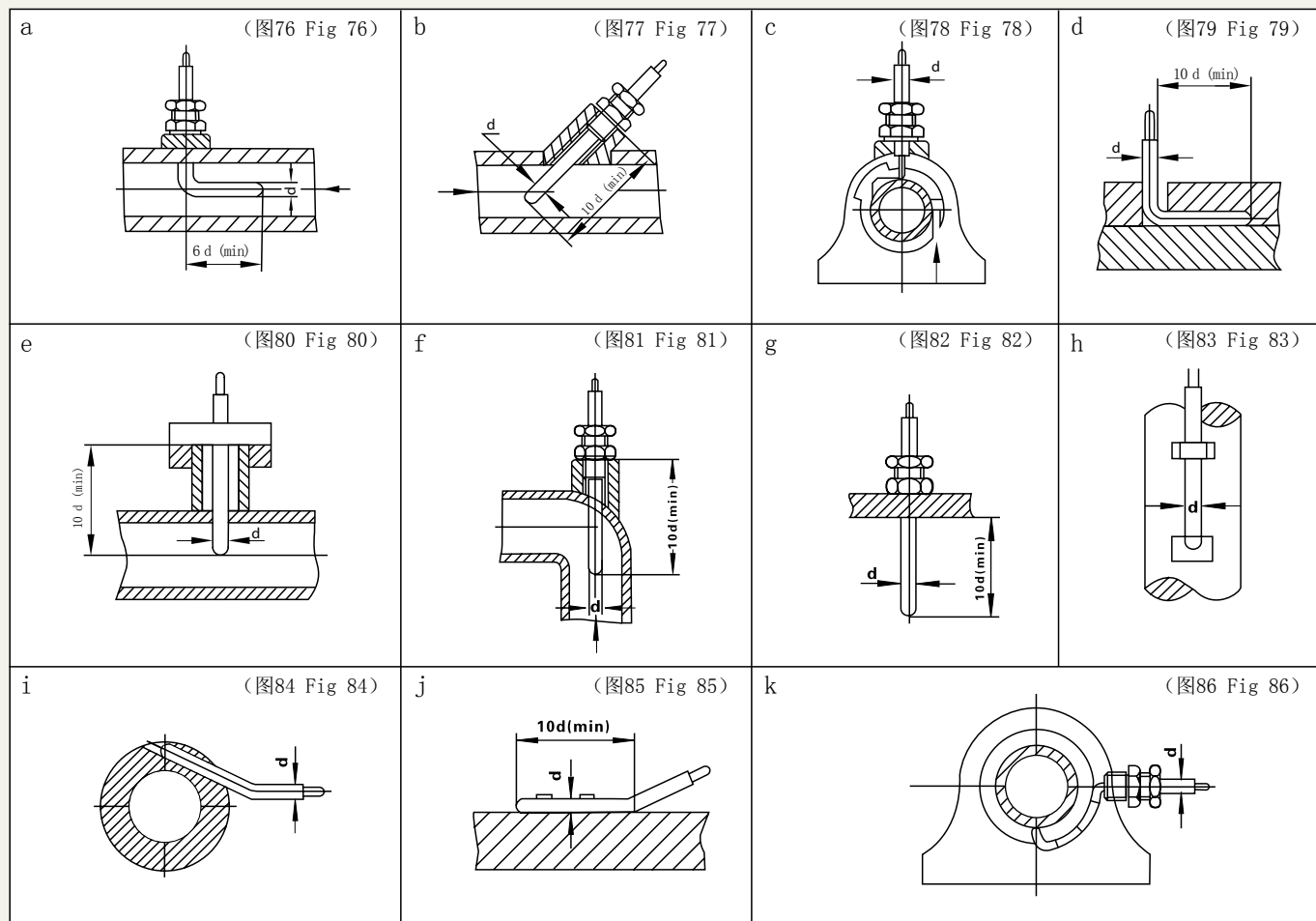
Note: (1) |t| is the absolute value of the measured temperature. (2) The type with -1 is three-wire system shielded conductor, and that with -2 is two-wire system unshielded conductor with oil-proof sheath, and that with -3 is three-wire system unshielded conductor with oil-proof sheath and that with -4 is three-wire system shielded conductor with oil-proof sheath. The type for leading-out wire can be selected as the users required. (3) The leading-out wire over 5m selects four-wire system. (4) “\*” indicates that between the two tolerances, the bigger one is selected.





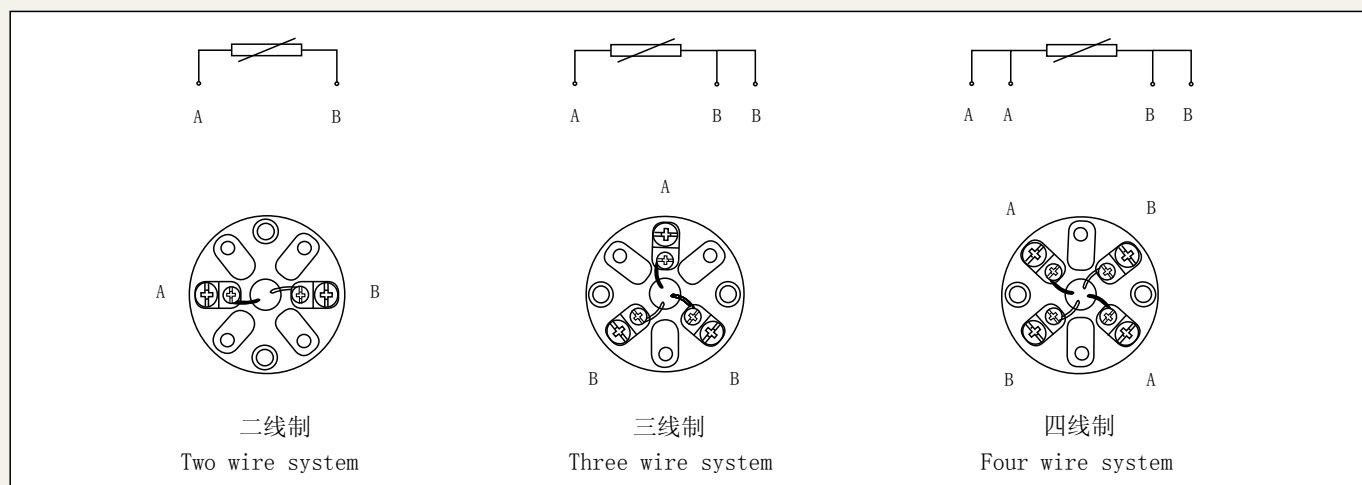
## 铠装铂电阻热电偶安装示意图

Installation fixed form of sheathed platinum thermal resistance thermocouple



## 接线示意图Wiring diagram

(图87 Fig 87)



# 隔爆热电阻、热电偶

## Explosion-proof tc and rtd (Eptc and eprtd)

在化学工业、石化业、天然气和冶金等生产现场常伴有各种易燃、易爆气体、蒸汽、使用普通的热电偶、热电阻容易引起环境气体爆炸。因此，必须使用隔爆型热电偶、热电阻用温度传感器，隔爆型热电偶、热电阻产品适用在dIIBT4和dIICT5温度级别区间内具有爆炸性气体的场所内使用。符合IEC60079标准，GB3836标准。

Regular TC and RTD may cause explosion in certain fields of production where there are inflammable and explosive gas and steam, in such case, EPTC and EPRTD must be used as temperature detector. This type of product is suitable to be used where the explosive vapor may be present in DIIBT4 and DIICT5 areas. It shall comply with IEC60079 standards and GB3836 standards.

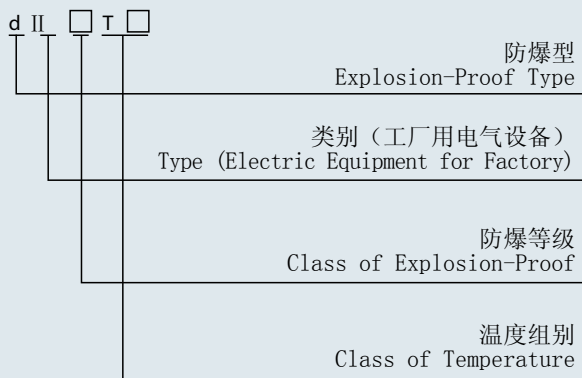


### 防爆标志、类别、级别和温度组别

Explosive mark, category, class and temperature class  
LABEL, TYPE, CLASS LF EP AND

隔爆热电偶、热电阻的防爆标志表示方法

Type, Class Of Electrical Equipment and Class of EPTC AND EPRTD.



### \* 电气设备的类别、级别和温度组别说明

Introduction of category, grade and temperature class of electric equipment

电气设备分为二类：I类——煤矿井下用电气设备；

II类——工厂用电气设备。

I The designational expression of the explosive mark of Label Of EPTC And EPRTD

Two classes for electric equipment: Class I -For mining

dII T II-For factory

### \* 防爆等级 Explosion-proof Classes

隔爆热电偶、热电阻的防爆等级按其适用于爆炸性气体混合物最大安全间隙分A、B、C三级。

Explosion-proof Class of EPTC AND EPRTD are classified as A.B and C dependant on the applicability to the maximum safety clearance of explosive vapor mixture.

### \* 温度组别 Classes Of Temperature

隔爆热电偶、热电阻的温度组别按其外露部分最高表面温度分为T1~T6六组。

Temperature of EPTC and EPRTD is divided into 6 groups: T1~T6 according to the highest surface temperature of the exposed parts.

防爆级组：d II BT4、Ex d II CT5、Ex ia II CT5(本安)、DIP DT T11 (粉尘)。

Type and Classes of explosion-proof (EP) Explosion-proof Classes: d II BT4, Ex d II CT5, Ex ia II CT5 (Intrinsic safety). DIP DT T11 (Powder)  
外壳防护等级：IP54、IP65 (GB4208标准)。

Protection level of case: IP54 and IP65 (GB4208 Standard).

温度组别与最高表面温度和引燃温度的对应关系

Relationship between temperature class/maximum surface temperature and ignition temperature (表24 Table 24)

温度级别 Class of Temperature	允许最高表面温度 (°C) Allowable Highest Surface Temperature (°C)	引燃温度 $t_i$ (°C) Ignition temperature
T1	450	$450 < t_i$
T2	300	$300 < t_i \leq 450$
T3	200	$200 < t_i \leq 300$
T4	135	$135 < t_i \leq 200$
T5	100	$100 < t_i \leq 135$
T6	85	$85 < t_i \leq 100$

注：应在环境温度为-20~+40°C，空气相对湿度≤95%（在+25°C时）范围内运行。高于此环境条件下运行，则会降低其温度组别。

Note: When operating, the environment temperature shall be -20°C~+40°C, the temperature relative humidity shall ≤95% (at +25°C). The temperature class will be lowered if environmental condition beyond this range.

热电偶、热电阻类别、测量范围、等级与允差

Type, Measuring Range and Tolerance of Various TC and RTD (表25 Table 25)

类型 Type	分度号 Graduation mark	代号 Code	测量范围 (°C) Measuring Range (°C)	精度等级 Accuracy Class	允许偏差 $\Delta t$ (°C) Tolerance $\Delta t$ (°C)
热电偶 Thermocouple	K	WRN	0~800	1	$\pm 1.5^\circ\text{C}$ or $\pm 0.004t$
				2	$\pm 2.5^\circ\text{C}$ or $\pm 0.0075t$
热电偶 Thermocouple	E	WRE	0~600	1	$\pm 1.5^\circ\text{C}$ or $\pm 0.004t$
				2	$\pm 2.5^\circ\text{C}$ or $\pm 0.0075t$
热电偶 Thermocouple	J	WRJ	0~500	1	$\pm 1.5^\circ\text{C}$ or $\pm 0.004t$
				2	$\pm 2.5^\circ\text{C}$ or $\pm 0.0075t$
热电偶 Thermocouple	T	WRT	-40~+350	1	$\pm 0.5^\circ\text{C}$ or $\pm 0.004t$
				2	$\pm 1^\circ\text{C}$ or $\pm 0.0075t$
铂热电阻 Platinum Thermocouple	Pt100	WZP	-200~+850	A	$-200 \sim +650$ $\pm (0.15 + 0.002  t )$
				B	$-200 \sim +850$ $\pm (0.30 + 0.005  t )$

注：(1) 式中“ $|t|$ ”为感温元件的实测温度。

(2) “\*”表示允许偏差两者中取其大者。

Note: (1) “ $|t|$ ” is the measured temperature of the temperature-sensing element.

(2) “\*” means to choose the bigger one between the two tolerances.

外壳防护等级IP与NEMA对应关系Coincidence relation of the degree of protection of case and NEMA

(表26 Table 26)

IP代码	IP30	IP32	IP64	IP32	IP64	IP66	IP66	IP67	IP65	IP65
NEMA代码	1	2	3	3R	3S	4	4X	6	12	13

注：由于NEMA将额外的环境因素考虑在内，所以外壳防护类型不相同于IEC外壳归类。不能简单由IP代码直接转换成NEMA形式。

Note: Since NEMA is concerned with additional environmental conditions, the protective type of case is different from the IEC classification.  
So the NEMA form coming from the direct conversion of simple IP code is not available.

爆炸性危险区域的划分Geographic division of explosive and dangerous area (表27 Table 27)

0区 0 Area	1区 1 Area	
本质安全型/Ex ia II c Intrinsic safety type	本质安全型/Ex ia/ib II c Intrinsic safety type	隔爆型/Ex d II c Explosion suppression
爆炸性环境中的爆炸性混合物以气体蒸气或薄雾形式连续出现或长时间存在的场所。 Places in the explosive environment where explosive mixture continuously comes out or exists in long time in form of gas, steam or mist.	在正常运行时，爆炸性环境中出现气体、蒸气或薄雾形式的爆炸性混合物场所。 Places where the explosive mixture comes out in form of gas, steam or mist during normal running.	

爆炸性物质的分类和级别Classification and grade of explosive materials (表28 Table 28)

类/级别 Class/Grade	MESG (mm)	MIC
IIA	>0.9	>0.8
IIB	0.5~0.9	0.45~0.8
IIC	<0.5	<0.45

注：（1）MESG—爆炸性气体混合物最大试验安全间隙。  
（2）MIC—爆炸性气体混合物最小点燃电流的比值。  
（3）IIA、IIB、IIC也是爆炸性气体混合物的传爆级别。  
Note: (1) MESG—Maximum Experimental Space Gap.  
（2）MIC—Minimum Igniting Current.  
（3）IIA, IIB and IIC — Propagated blast grade.

爆炸性气体混合物的分类和分组Classification and grouping of explosive gas mixture (表29 Table 29)

代表性气体 Representative gas	中国/IEC/EN CN	北美 (NEC/CEC) North American
乙炔Acetylene	IIC级 IIC grade	I级, A组 I grade A class
氢气Hydrogen gas	IIC级 IIC grade	I级, B组 I grade B class
乙烯Ethylene	IIB级 IIB grade	I级, C组 I grade C class
丙烷Propane	IIA级 IIA grade	I级, D组 I grade D class

气体和蒸气传爆级别及自燃温度组别的分类  
Classification of the propagated blast grade of gas and steam and spontaneous ignition temperature class (表30 Table 30)

级别/组别 Grade/Class	T1	T2	T3	T4	T5	T6
IIA	甲烷, 乙烷, 丙烷, 苯乙烯, 苯, 甲苯, 二甲苯, 三甲苯, 苯, 一氧化碳, 苯酚, 甲酚, 丙酮, 乙酸甲酯, 乙酸, 氯乙酸, 氯苯, 氨, 乙腈, 苯胺 Methane, ethane, propane, styrene, benzene, toluene, xylene, trimethylbenzene, naphthalene, carbon monoxide, carbolic acid, formaldehyde, acetone, methyl acetate, ethane, chloroacetic acid, chlorobenzene, ammonia, cyanogens and aniline.	丁烷, 环戊烷, 丙稀, 乙苯, 异丙苯, 甲醇, 乙醇, 丙醇, 丁醇, 甲酸甲酯, 甲酸乙酯, 乙酸乙酯, 甲基丙烯酸甲酯, 二氯乙烷, 氯乙烯, 甲胺, 二甲胺 Butane, cyclopentane, propylene, ethylbenzene, cumene, methanol, ethanol, propanol, butanol, methyl formate, ethyl formate, ethyl acetate, methyl methacrylate, dichloroethane, chloroethylene, methylamine, and dimethylamine.	戊烷, 乙烷, 庚烷, 辛烷, 壬烷, 癸烷, 环己烷, 松节油, 石脑油, 石油, 汽油, 燃料油, 煤油, 柴油, 戊醇, 乙醇, 环乙醇 Pentane, ethane, heptane, octane, nonane, decane, cyclohexane, turpentine, naphtha, petroleum, gasoline, fuel oil, diesel oil, amylalcohol and ethanol	乙醛, 三甲胺 Acetaldehyde and trimethylamine	-	-
IIB	丙炔, 环丙烷, 丙稀腈, 氰化氢, 焦炉煤气 Allylene, cyclopropane, acrylonitrile, hydrogen cyanide and coke oven gas	乙烯, 丁二烯, 环氧乙烷, 环氧乙烷, 环氧丙烷, 丙稀酸甲酯, 丙稀酸乙酯, 咪唑 Ethylene, butadiene, ethylene oxide, propylene oxide, methyl acrylate, ethyl acrylate and furan	二甲醚, 丁烯醛, 丙稀醛, 四氢呋喃, 硫化氢 Dimethyl enther, butenoic aldehyde, tetrahydrofuran and hydrogen sulfide	乙基甲基醚, 二乙醚, 醚, 四氯乙烯 Methyl Ethyl Ether, diethyl ether, ether and tetrafluoroethylene	-	-
IIC	氢, 水煤气 Hydrogen and water gas	乙炔 Acetylene	-	-	二硫化碳 Carbon bisulfide and ethyl nitrate	硝酸乙脂 Ethyl nitrite



type, for example, WRN-24A. (4) Refer to page 91, Fig 147 for the specification of straight protection tube fixed bolt. The normal delivery of goods is 1Cr18Ni9Ti, if other material is necessary, please note it separately.

固定法兰式隔爆热电偶、铂热电阻Fixed-flange explosion-proof TC and Platinum RTD (图89 Fig 89)

型号Type	分度号 Graduation mark	测量范围 Measuring range (℃)	热响应时间Thermal response time τ 0.5(s)	保护管材料 Protection tube material	规格Specification (mm)	
					d	L×l
WRN-440 (K) WRN <sub>2</sub> -440 (K)	K	0~800	≤45	*1Cr18Ni9Ti	Φ 16	250×100
WRE-440 (K) WRE <sub>2</sub> -440 (K)	E	0~600				300×150
						350×200
WRJ-440 (K) WRJ <sub>2</sub> -440 (K)	J	0~500				400×250
						450×300
WRT-440 (K) WRT <sub>2</sub> -440 (K)	T	-40~+350	550×400			
			650×500			
WZP-440 (K) WZP <sub>2</sub> -440 (K)	Pt100	- 200~+500	900×750			
			1150×1000			
WZP-441 (K) WZP <sub>2</sub> -441 (K)			≤30		Φ 12	1650×1500
				2150×2000		

注：（1）公称压力：2.5MPa。（2）K内芯采用铠装元件。（3）型号后面加“A”为ANSI标准法兰。例：WRN-440N。选用JB-T标准法兰，参见92页，图150。“\*” 常规供货为1Cr18Ni9Ti，如需其它材质另行注明。  
Note: (1) Nominal pressure is 2.5 Mpa. (2) K inner core is sheathed element. (3) Those that have “A” attached is ANSI standard flange, for example, WRN-440N. Refer to page 92, Fig 150 for the JB-T standarda flange. The normal delivery of goods is 1Cr18Ni9Ti, if other material is necessary, please note it separately.

固定螺栓锥形保护管式隔爆热电偶、铂热电阻 Fixed-bolt taper protection tube explosion-proof TC and Platinum RTD (图90 Fig 90)

型号Type	分度号 Graduation mark	测量范围 Measuring range (℃)	热响应时 间Thermal response time τ 0.5(s)	保护管材料 Protection tube material	规格Specifacaton (mm)	
					d	L X
WRN-640 (K) WRN <sub>2</sub> -640 (K)	K	0~600	≤60	*1Cr18Ni9Ti	φ 16	250 ×100
WRE-640 (K) WRE <sub>2</sub> -640 (K)	E					300 ×150
						350 ×200
		400 ×250				
WZP-640 (K) WZP <sub>2</sub> -640 (K)	pt100	-200~ 500				450 ×300
			500 ×350			

注：（1）公称压力：30Mpa。流速≤80m/ s。（2）K内芯采用铠装元件。（3）选用英制G1”螺栓，型号后加A。例：WRN-640(A)。（4）锥形保护管固定螺栓规格参见92页，图148。“\*” 常规供货为1Cr18Ni9Ti，如需其它材质另行注明。  
Note: (1) Normal pressure: 30Mpa. Flow rate≤80m/s. (2) K inner core is sheathed element. (3) British system G1”that is selected shall mark A behind the type, for example, WRN-640(A). (4) Refer to page 92, Fig 148 for specification of taper protection fixed bolt. The normal delivery of goods is 1Cr18Ni9Ti, if other material is necessary, please note it separately.

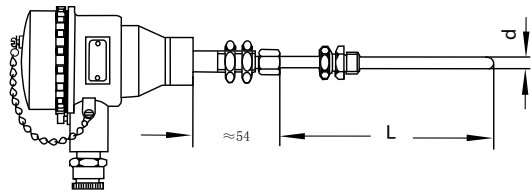


## 固定卡套螺栓式隔爆铠装热电偶、铂热电阻

Fixed-ferrule bolt explosion-proof sheathed TC and Platinum RTD

(图91 Fig 91)

型号Type	分度号 Graduation mark	测量范围 Measuring range (℃)	热响应时间 Thermal response time τ 0.5(s)	保护管材料 Protection tube material	规格Specification (mm)	
					d	L
WRNK-241 WRN K <sub>2</sub> -241	K	0~800	≤1.2 ≤2.5 ≤4 ≤6 ≤8	*1Cr18Ni9Ti	φ3	100
WREK-241 WREK <sub>2</sub> -241	E	0~600			φ4	150
					φ5	200
WRJK-241 WRJK <sub>2</sub> -241	J	0~500			φ6	250
					φ8	300
WRTK-241 WRTK <sub>2</sub> -241	T	-40~+350			350	
					400	
WZPK-244 WZPK <sub>2</sub> -244	Pt100	- 200~+500	≤5		φ4	450
						500
≤8			φ5		550	
					600	
WZPK-245 WZPK <sub>2</sub> -245			≤12			750
						1000
WZPK-246 WZPK <sub>2</sub> -246			≤18		φ6	1500
					2000	
WZPK-248 WZPK <sub>2</sub> -248				2500		
				3000		



注：公称压力：2.5Mpa。（2）卡套螺栓规格参见90页，图141。“\*”常规供货为1Cr18Ni9Ti，如需其它材质另行注明。

Note: (1) Nominal pressure: 2.5Mpa. (2) Refer to page 90, Fig 141 for specification of ferrule bolt. The normal delivery of goods is 1Cr18Ni9Ti, if other material is necessary, please note it separately.

Fixed ferrule flange explosion-proof sheathed TC and Platinum RTD

型号Type	分度号 Graduation mark	测量范围 Measuring range (℃)	热响应时间 Thermal response time $\tau$ 0.5(s)	保护管材料 Protection tube material	规格 Specification (mm)						
					d	L					
WRNK-441 WRND <sub>2</sub> -441	K	0~800	$\leq 1.2$ $\leq 2.5$ $\leq 4$ $\leq 6$ $\leq 8$	*1Cr18Ni9Ti	$\phi 3$	100					
WREK-441 WREK <sub>2</sub> -441	E	0~600			$\phi 4$	150					
					$\phi 5$	200					
WRJK-441 WRJK <sub>2</sub> -441	J	0~500			$\phi 6$	250					
					$\phi 8$	300					
WRTK-441 WRTK <sub>2</sub> -441	T	-40~+350				350					
						400					
						450					
						500					
WZPK-444 WZPK <sub>2</sub> -444	Pt100	-200~+500	$\leq 5$		$\phi 4$	550					
			$\leq 8$			600					
WZPK-445 WZPK <sub>2</sub> -445					$\phi 5$	750					
$\leq 12$					1000						
			WZPK-446 WZPK <sub>2</sub> -446					$\phi 6$	1500		
$\leq 18$					2000						
			WZPK-448 WZPK <sub>2</sub> -448					$\phi 8$	2500		
									3000		

Technical drawing of a thermocouple probe assembly. The drawing shows a cross-section of the probe. Key dimensions are labeled: a distance of approximately 54mm from the base to the tip, a total length L, and a diameter d at the tip.

(2) Refer to Page 92, Fig 149 for the specification of ferrule flange. The normal delivery of goods is 1Cr18Ni9Ti, if other material is necessary, please note it separately.

Explosion-proof single sheathed RTD: WZP K-245 Pt100  $\phi 5$  l=2 M 9

## 电站测温用热电偶、热电阻

## TC and TRD for temperature measurement in power plant

普通结构的热电偶、热电阻，已不能适应电站工作环境中高温、高压、高速蒸汽流的特殊要求。因此，有专供电站用特殊型热电偶、热电阻，由用户根据不同的温度、压力及蒸汽流速来选用。

The TC and TRD of ordinary structure has not met the special requirements of high temperature, high pressure and high-speed steam flow of the power plant. Therefore, there are TCs and RTDs especially special for power plant. Users can select them in accordance with different temperature, pressure and steam flow speed.



## 主要技术指标Major technical index

热电偶、热电阻类别、测量范围与允差Class, measuring range and tolerance of TC and RTD

(表31 Table 31)

类型Model	分度号 Graduation mark	代号 Code	测量范围(℃) Measuring range	精度等级 Accuracy class	允许仪式差Δt℃ Tolerance
热电偶 Thermocouple	K	WRNT	0~800	1	*±1.5℃ or ±0.004t
				2	*±2.5℃ or ±0.0075t
热电偶 Thermocouple	E	WRET	0~600	1	*±1.5℃ or ±0.004t
				2	*±2.5℃ or ±0.0075t
热电偶 Thermocouple	T	WRTT	-40~+350	1	*±1.5℃ or ±0.004t
				2	*±2.5℃ or ±0.0075t
铂热电阻 Platinum Thermocouple	Pt100	WZPT	-200~+850	A	-200~+650 ±(0.15+0.002 I t I)
				B	-200~+850 ±(0.30+0.005 I t I)

注：(1) 式中“ $I t I$ ”为感温元件的实测温度。(2) “\*”表示允许偏差两者中取其大者。

Note: (1) “ $I t I$ ” is the measured temperature of temperature-sensing element. (2) “\*” means to select the bigger between the two tolerances.

## 热套型热电偶、热电阻Heat shielded thermocouple and shrink thermal resistace

热套型的热套式、焊接式、螺栓式热电偶、热电阻主要用于测量蒸汽管道及锅炉温度。

The thermocouple and thermal resistance of heat-shielded type such as heat-shielded model, welding model and roll-bolt are used to measure the temperature of steam line and boiler.

热套式、焊接式、螺栓式热电偶、热电阻采用保护管与连接管能任意拆装、转向和内芯铠装元件可分离方式，它的优点是便于热电偶、热电阻的维修或更换，而无需停机。保护管安装时，可用焊接或机械方法固定在设备上，然后安装上热电偶、热电阻铠装元件就可工作。

产品参照美国EBASCO公司规范，可替代进口，能满足国产或进口的300MW、600MW、900MW发电机组配套需要。

The thermocouple and thermal resistance of heat-shielded type, welding type roll-bolt type adopt a way which can dismount or mount and turn the protection tube and connecting tube at will and share the inner sheathed elements. In this way, they are easy to maintain and change without shutting down the machine. To install the protection tube can use welding or mechanical methods to fix it on the equipment, and then fit on the sheathed elements of thermocouple and thermal resistance. When such steps finish, it can work.

Ther products, referring to US EBASCO company standard, can substitute imported products, meeting the matching needs of the home-made or imported generating set of 300MW、600MW、900MW.

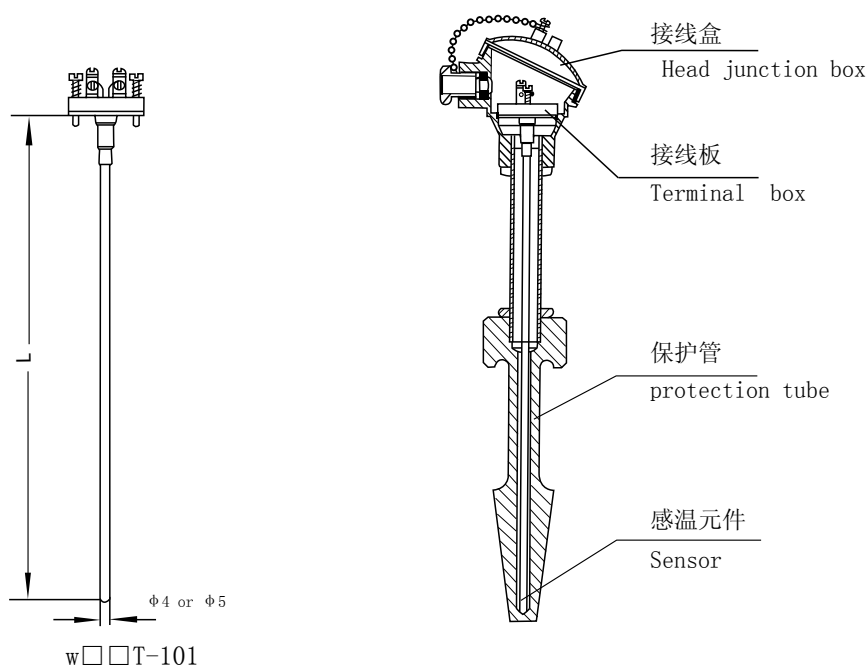
内芯均采用弹簧压紧式铠装元件，与一般铠装内芯有所不同，它借助弹簧压力使其端部始终与保护管内端面接触，这样既有较小的热惰性，又能消除因振动而引起对使用寿命的影响。

The inner cores, with spring-pressing sheathed elements, resort to spring pressure to make the end contact with the end face in the protection tube, by which, a bit of thermal inertia can be brought into while the influence on the use and life arose from the vibration can be eliminated.

## 热套式热电偶、铂热电阻基本结构

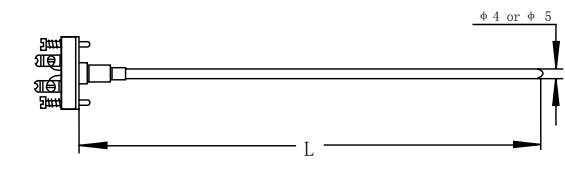
### Heat-shielded TC and TRD structural representation

(图93 Fig 93)



弹性压紧式热电偶、铂热电阻 Spring Compression Type Of TC And Pt-RTD

(图94 Fig 94)

型号Type	分度号Graduation mark	测量范围Measuring range (°C)	L (mm)	
WRNT-001 WRNT <sub>2</sub> -001	K	0~800	250 375 555 925	
WRET-001 WRET <sub>2</sub> -001	E	0~600	255 380 575 1175 275 405 605 1405	
WZPT-001 WZPT <sub>2</sub> -001	Pt100	-200~+500	280 425 655 1425 305 455 675 1525 325 475 705 1675	
			355 505 905 2175	

注：（1）本公司产品弹性压紧式热电偶、铂热电阻的内芯更换，其长度正确选用应为保护管的总长度“L”再增加30mm。

例：保护管总长度L=300mm，其内芯长度为330mm。

（2）保护管材料：1Cr18Ni9Ti。

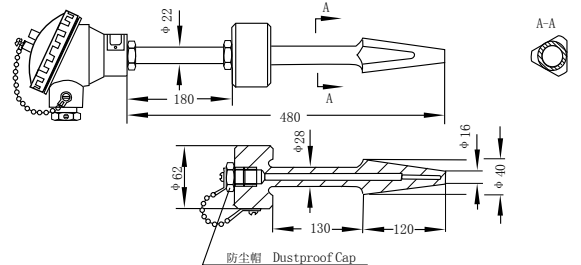
Note: (1) The selected length of the spring compression type of TC and Pt-RTD for changing inner core shall be the overall length of the protection tube “L” plus 30mm.

For example: If the overall length of the protection tube L=300mm, then the length of the inner core is 330mm.

(2) Protection tube material: 1Cr18Ni9Ti.

热套式热电偶、铂热电阻 Heat-shielded thermocouple and platinum thermal resistance

(图95 Fig 95)

型号Type	分度号Graduation mark	测量范围Measuring range (℃)	保护管材料 Protection tube material	
WRNR-01 WRNR <sub>2</sub> -01	K	0~600	1Cr18Ni9Ti	
WRER-01 WRER <sub>2</sub> -01	E			
WZPR-01 WZPR <sub>2</sub> -01	Pt100	0~500		

注：（1）公称压力：30MPa。流速≤80m/s。热响应时间  $\tau$  0.5: ≤60s。

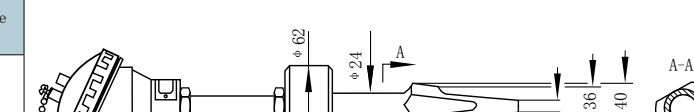
（2）防尘帽为可选配件。

Note: (1) Nominla pressure: 30mpa. Flow rate≤80m/s. Thermal response time  $\tau$  0.5: ≤60s.

(2) The dust caps are options.

热套式热电偶 Heat-shielded thermocoupe

(图96 Fig 96)

型号Type	分度号 Graduation mark	测量范围 Measuring range (℃)	热响应时间t 0.5 (s) Thermal Response Time t 0.5 (s)	保护管材料 Protection tube material		
WRN-634 WRN <sub>2</sub> -634	K	0~600	≤20	1Cr18Ni9Ti		
WRN-635 WRN <sub>2</sub> -635			≤30			
WRE-634 WRE <sub>2</sub> -634	E		≤20			
WRE-635 WRE <sub>2</sub> -635			≤30			

注：（1）公称压力：30MPa。流速≤80m/s。

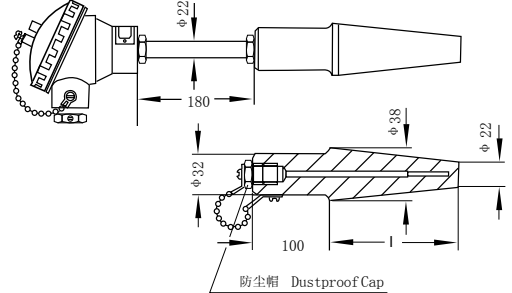
（2）WR□-634型的铠装内芯测量端型式为接壳式，WR□-635型为绝缘式。

Note: (1) Nominla pressure: 30mpa. Flow rate≤80m/s.

(2) The measuring form of the sheathed inner core of WR□-634 type is shell-connecting type, and the WR□-635 type is insulation type.

焊接式热电偶、铂热电阻Welding thermocouple and platinum thermal resistance

(图97 Fig 97)

型号 Type	分度号 Graduation mark	测量范围 Measuring range (°C)	保护管材料 Protection tube material	l (mm)	
WRNR-13 WRNR <sub>2</sub> -13	K	0~800	1Cr18Ni9Ti	50	
WRER-13 WRER <sub>2</sub> -13	E	0~600		75	
WZPR-13 WZPR <sub>2</sub> -13	Pt100	0~500		100	
				150	

注：（1）公称压力：30MPa。流速≤80m/s。热响应时间  $\tau_{0.5}$ ：≤75s。

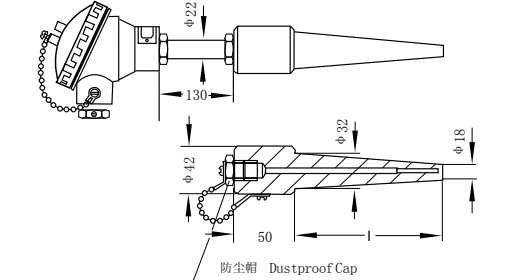
（2）防尘帽为可选配件。

Note: (1) Nominla pressure: 30Mpa. Flow rate≤80m/s. Thermal response time  $\tau_{0.5}$ : ≤75s.

(2) The dust caps are options.

焊接式热电偶、铂热电阻Welding thermocouple and platinum thermal resistance

(图98 Fig 98)

型号 Type	分度号 Graduation mark	测量范围 Measuring range (°C)	保护管材料 Protection tube material	l (mm)	
WRNR-14 WRNR <sub>2</sub> -14	K	0~600	1Cr18Ni9Ti	50	
WRER-14 WRER <sub>2</sub> -14	E			75	
				100	
WZPR-14 WZPR <sub>2</sub> -14	Pt100	0~500		150	

注：（1）公称压力：30MPa。流速≤80m/s。热响应时间  $\tau_{0.5}$ ：≤60s。

（2）防尘帽为可选配件。

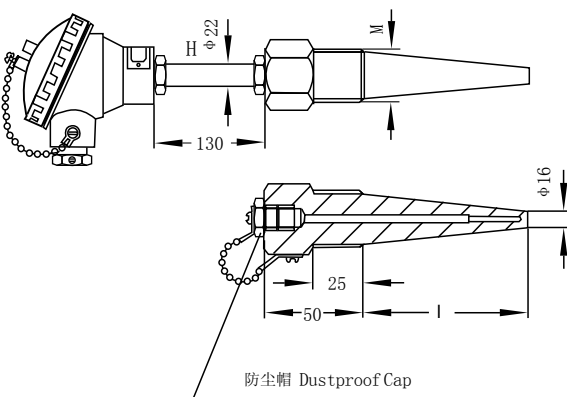
Note: (1) Nominla pressure: 30Mpa. Flow rate≤80m/s. Thermal response time  $\tau_{0.5}$ : ≤60s.

(2) The dust caps are options.

固定螺栓锥形保护管式热电偶、铂热电阻

Fixed bolt taper protection tube thermocouple and platinum thermal resistance

(图99 Fig 99)

型号Type	分度号Graduation mark	测量范围Measuring range (℃)	保护管材料 Protection tube material	l (mm)		
WRNR-15 WRNR <sub>2</sub> -15	K	0~600	1Cr18Ni9Ti	50		
WRNR-15A WRNR <sub>2</sub> -15A				75		
WRNR-15B WRNR <sub>2</sub> -15B				100		
WRER-15 WRER <sub>2</sub> -15	150					
WRER-15A WRER <sub>2</sub> -15A	200					
WRER-15B WRER <sub>2</sub> -15B	250					
WRER-15B WRER <sub>2</sub> -15B	E	0~600		300		
WZPR-15 WZPR <sub>2</sub> -15				350		
WZPR-15A WZPR <sub>2</sub> -15A				400		
WZPR-15B WZPR <sub>2</sub> -15B	Pt100	0~500		450		
WZPR-15A WZPR <sub>2</sub> -15A				500		
WZPR-15B WZPR <sub>2</sub> -15B						

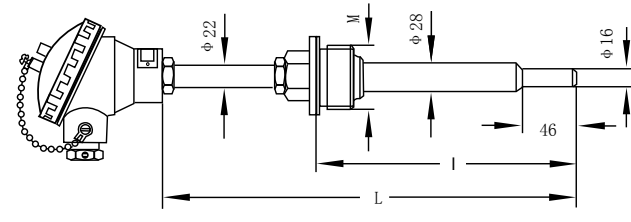


- 注：（1）公称压力：30MPa。流速 $\leq 80\text{m/s}$ 。热响应时间 $\tau 0.5: \leq 60\text{s}$ 。  
 （2）15型螺栓为M33 $\times$ 2，15A型螺栓为NPT1，15B型螺栓为M33 $\times$ 2齿形垫片规格参见93页，图152。  
 （3）常规产品H=130 mm，当产品的连接管“H”需要加长时，尺寸由用户自定。（4）防尘帽为可选配件。

Note: (1) Nominla pressure: 30Mpa. Flow rate $\leq 80\text{m/s}$ . Thermal response time  $\tau 0.5: \leq 60\text{s}$ .  
 (2) Bolt of 15 type is M33 $\times$ 2, that of 15A type is NPT1, the 15B type is M33 $\times$ 2. Refer to page 93, Fig 152 for specification of grooved metal gasket.  
 (3) For the conventional product, H is equal to 130mm, but when the H need to lengthen, the size can be determined by users.  
 (4) The dust caps are options

### 烟风道用热电偶、铂热电阻 Thermocouple and platinum thermal resistance for flue

(图100 Fig 100)

型号Type	分度号 Graduation mark	测量范围Measuring range (℃)	保护管材料 Protection tube material	规格 (mm) Specification	
				L X l	
WRNR-12 WRNR <sub>2</sub> -12	K	0~800	1Cr18Ni9Ti	480×230 680×430 880×630 1380×1130 1500×1350 1650×1500 2150×2000	
WRER-12 WRER <sub>2</sub> -12	E	0~600			
WZPR-12 WZPR <sub>2</sub> -12	Pt100	0~500			

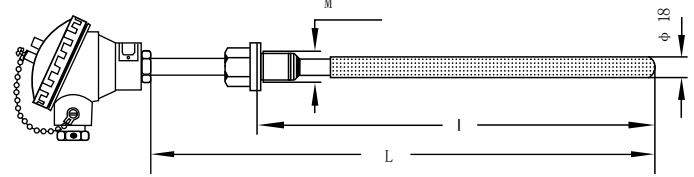
- 注：（1）公称压力：10MPa。流速 $\leq 9\text{m/s}$ 。热响应时间 $\tau 0.5: \leq 45\text{s}$ 。（2）螺栓M：G2”、M60 $\times$ 3、NPT<sub>2</sub>、R<sub>2</sub>。

Note: (1) Nominla pressure: 10Mpa. Flow rate $\leq 80\text{m/s}$ . Thermal response time  $\tau 0.5: \leq 45\text{s}$ .  
 (2) Tread M: G2”, M60 $\times$ 3, NPT<sub>2</sub>, R<sub>2</sub>.

### 煤粉仓用耐磨热电偶、铂热电阻

### Abrasion thermocouple and platinum thermal resistance for coal dust storehouse

(图101 Fig 101)

型号Type	分度号 Graduation mark	测量范围Measuring range (°C)	规格 (mm) Specification	
			L X l	
WRNN-42HL WRNN <sub>2</sub> -42HL	K	0~800	2150 $\times$ 2000	
WREN-42HL WREN <sub>2</sub> -42HL	E	0~600	2650 $\times$ 2500	
			3150 $\times$ 3000	
WZPN-42 WZPN <sub>2</sub> -42	Pt100	0~500	3650 $\times$ 3500	
			4150 $\times$ 4000	
			5150 $\times$ 5000	
			6150 $\times$ 6000	
			7150 $\times$ 7000	
			8150 $\times$ 8000	
			9150 $\times$ 9000	
			10150 $\times$ 10000	

- 注：（1）煤粉仓用热电偶、铂热电阻，保护管的插入长度凡超出2米，将分段制成以2米为基本长度的联接结构的形式。（2）保护管首段采用特种耐磨材料。（3）单支铂热电阻、双支铂热电阻，均为四线制。（4）直形保护管固定螺栓规格参见91页，图147。

Note: (1) Of abrasion thermocouple and platinum thermal resistance for coal dust storehouse, these protciton tubes that the inserted length exceeds 2m will be divided to make a form of linkage structure, taking 2m as the basic length. (2) The first section of the protection tube is made of special abrasion resistance materials. (3) Single pt thermal resistance, double pt thermal resistance, both are four-wire system. (4) Refer to page 91, Fig 147 for sepecification of fixed bolt of straight protection tube.

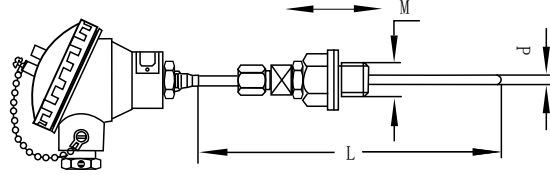
### 轴承热电偶、铂热电阻 Bearing thermocouple and thermal resistance

轴承热电偶、铂热电阻，主要用于测量电站各种带有轴承设备的轴承温度。固定装置具有抗震动、防渗油结构，元件的测量端部紧顶被测物表面，从而提高温度测量的准确性。

Bearing thermocouple and thermal resistance are mainly used to measure the temperature of various equipments fitted on bearings. The fixed devices is providee with structure to resist to vibration and oil leakage. The measuring end is tightly touched on the surface of the objects to be measured, improving the accuracy of the measurement.

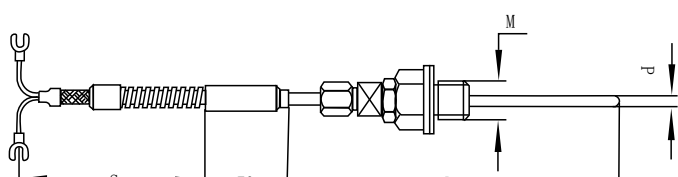
轴承热电偶、铂热电阻Bearing thermocouple and thermal resistance

(图102 Fig 102)

型号Model	分度号 Graduation mark	测量范围(℃) Measuring range	L (mm)	M	d (mm)	
WRNT-31 WRNT <sub>2</sub> -31	K	0~200	100	M16×1.5 M18×1.5 M20×1.5 M27×2 G 1/2" G 3/4"	φ 3 φ 4 φ 5 φ 6 φ 8	
WRET-31 WRET <sub>2</sub> -31	E		150			
WRIT-31 WRIT <sub>2</sub> -31	T		200			
			250			
			300			
WZPT-31 WZPT <sub>2</sub> -31	Pt100		350			
			400			
			450			
			500			

轴承热电偶、铂热电阻Bearing thermocouple, platinum thermal resistance

(图103 Fig 103)

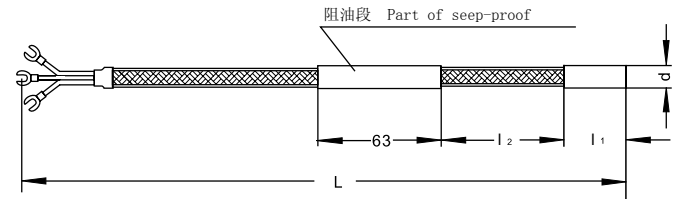
型号Model	分度号 Graduation mark	测量范围(℃) Measuring range	L (mm)	M	d (mm)	
WRNT-393P A WRNT <sub>2</sub> -393P A	K	0~200	100	M16×1.5 M18×1.5 M20×1.5 M27×2 G 1/2" G 3/4"	φ 3 φ 4 φ 5 φ 6 φ 8	
WRET-393P A WRET <sub>2</sub> -393P A	E		150			
WRIT-393 A WRIT <sub>2</sub> -393 A	T		200			
			250			
			300			
WZPT-393P A WZPT <sub>2</sub> -393P A	Pt100		350			
			400			
			450			
			500			

- 注：（1）铠装热电偶的响应时间参见20页，图24。  
（2）铠装铂热电阻的热响应时间参见46页，表22。  
（3）导线延长式长度“S”常规附带500mm，若需增加请注明长度。

Note: (1) Refer to page 20, Fig 24 for the thermal response time of sheathed thermocouple.  
(2) Refer to page 46, table 22 for the thermal response time of sheathed platinum thermal resistance.  
(3) The extension wire type is always attached to 500mm, if the addition is needed, please note the length.

泵用铂热电阻Pump platinum thermal resistance

(图104 Fig 104)

型号Model	分度号 Graduation mark	测量范围(℃) Measuring range	热响应时间 Thermal response time $\tau_{0.5}(s)$	规格 Specification (mm)		
				d	$l_1$	
WZPT-41	Pt100	-50~+200	Cu	φ 3.2 φ 4 φ 5	15	
					20	
WZPT <sub>2</sub> -41				φ 4 φ 5	25	

- 注：（1）总长“L”及前段长度“ $l_2$ ”在订货时同用户自定。  
（2）热响应时间  $\tau_{0.5} \leq 5s$ 。

Note: (1) The overall length “L” and the forepart length “ $l_2$ ” can be determined by the users when they place the order.  
(2) The thermal response time  $\tau_{0.5} \leq 5s$ .

轴承用阻漏铂热电阻 Damping leakage platinum thermal resistance for bearing

(图105 Fig 105)

型号Model	分度号 Graduation mark	测量范围(℃) Measuring range	热响应时间 Thermal response time t0.5(s)	保护管材料 Protection tube material	d (mm)	
WZPT-83	Pt100	-50~+200	$\leq 3$	1Cr18Ni9Ti	$\Phi 3.2$	
WZPT-84 WZPT <sub>2</sub> -84			$\leq 5$		$\Phi 4$	
WZPT-85 WZPT <sub>2</sub> -85			$\leq 8$		$\Phi 5$	
WZPT-86 WZPT <sub>2</sub> -86			$\leq 12$		$\Phi 6$	

注:  $\Phi 3.2$ 仅提供单支元件,  $\Phi 4$ 、 $\Phi 5$ 、 $\Phi 6$ 可提供双支元件。Note:  $\Phi 3.2$  only supply single element.  $\Phi 4$ 、 $\Phi 5$ 、 $\Phi 6$  can provide double element.

轴承用双测点阻漏铂热电阻 Bearing dual-purpose station damping leakage pt thermal resistance

(图106 Fig 106)

型号Model	分度号 Graduation mark	测量范围(℃) Measuring range	热响应时间 Thermal response time t0.5(s)	保护管材料 Protection tube material	规格 Specification (mm)		
					L	S	
WZPM <sub>2</sub> -271	Pt100	-50~+200	$\leq 3$	Cu	1500 2000	1500 2000 3000	

固定法兰锥形保护管式热电偶、铂热电阻

Fixed flange taper protection tube thermocouple and platinum thermal resistance

(图107 Fig 107)

型号Model	分度号 Graduation mark	测量范围(℃) Measuring range	热响应时间 Thermal response time t0.5(s)	保护管材料 Protection tube material	规格 Specification (mm)	
					L X I	
WRNR-46 WRNR <sub>2</sub> -46	K	0~800	$\leq 60$	1Cr18Ni9Ti	250×100 300×150 350×200 400×250 450×300 500×350 550×400 600×450 650×500	
WRER-46 WRER <sub>2</sub> -46	E	0~600				
WZPR-46 WZPR <sub>2</sub> -46	Pt100	0~500				

注: (1) 公称压力: 10MPa。

(2) 型号后加A, 为ANSI标准法兰。例: WRNR -46A, 选用JB/T标准法兰, 参见92页, 图150。

Note: (1) Nominla pressure: 10Mpa

(2) The type with A attached to is the ANSI standard flange, for example WRNR -46A. Refer to page 92, Fig 150 select JB/T standard flange.

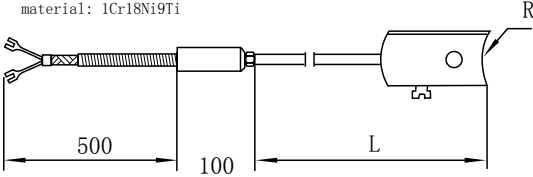
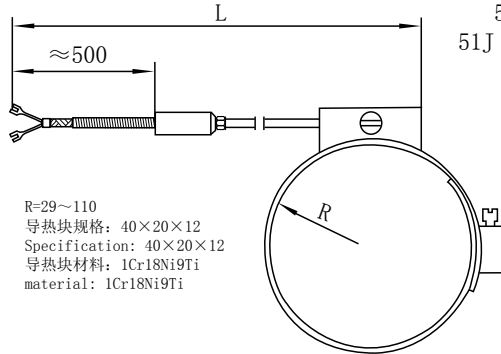
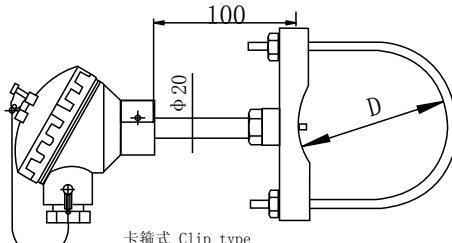
锅炉炉壁、管壁热电偶、热电阻Boiler furnace wall and tube wall thermal resistance and thermocouple

锅炉炉壁、管道用热电偶、铂热电阻是采用Φ4或Φ5直径的铠装元件作探头，用铠装电缆引出或用测温补偿导线引出，测量端导热板带有与管道或炉壁相吻合的曲面，用螺钉、焊接或卡箍的方法将导板固定在管（炉）壁上，通过导热板的传导，可测得炉壁或管道等表面温度。

The furnace wall of boiler, thermocouple of shell of pipe and platinum thermal resistance adopt the sheathed elements with the Φ4 or Φ5 diameter as probe, leaded out by armored cable or thermometric extension wire, whose heat conduction shield of measuring terminal is equipped with camber suitable for pipes or furnace wall and fixed to the tube( furnace) wall by bolts, welding or holding down clip. The surface temperature of the furnace wall or tubes can be measured by the conduction of the heat conduction shield.

集热铠装热电偶、热电阻(带集热板)

Heat collecting sheathed thermocouple and thermal resistance (with collecting plate) (图108 Fig 108)

型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range(℃)	插入方向 Placed Direction	固定型式 Fixed Type	L (毫米) L (mm)	
WRNT-11Z WRNT <sub>2</sub> -11Z	K	0~800	沿管道轴向 Along axial direction of pipeline	焊接固定导热板式 Welding fixed heat conduction shield	500 600 1000 2000 3000	<div>11Z型 11Z Type</div> <div>R=29~110 导热块规格: 40×20×12 Specification: 40×20×12 导热块材料: 1Cr18Ni9Ti material: 1Cr18Ni9Ti</div> 
WRET-11Z WRET <sub>2</sub> -11Z	E	0~600				
WZPT-11Z WZPT <sub>2</sub> -11Z	Pt100	-70~400				
WRNT-11J WRNT <sub>2</sub> -11J	K	0~800	沿管道径向 Along radical direction of pipeline	焊接固定导热板式 Welding fixed heat conduction shield	4000 5000 6000 8000 10000	<div>51J型 51J Type</div> <div>R=29~110 导热块规格: 40×20×12 Specification: 40×20×12 导热块材料: 1Cr18Ni9Ti material: 1Cr18Ni9Ti</div> 
WRET-11J WRET <sub>2</sub> -11J	E	0~600				
WZPT-11J WZPT <sub>2</sub> -11J	Pt100	-70~400				
WRNT-51Z WRNT <sub>2</sub> -51Z	K	0~800	沿管道轴向 Along axial direction of pipeline	焊接固定导热板式 Welding fixed heat conduction shield		
WRET-51Z WRET <sub>2</sub> -51Z	E	0~600				
WZPT-51Z WZPT <sub>2</sub> -51Z	Pt100	-70~400				
WRNT-51J WRNT <sub>2</sub> -51J	K	0~800	沿管道径向 Along radical direction of pipeline	焊接固定导热板式 Welding fixed heat conduction shield		
WRET-51J WRET <sub>2</sub> -51J	E	0~600				
WZPT-51J WZPT <sub>2</sub> -51J	Pt100	-70~400				
WRNT-031G WRNT <sub>2</sub> -031G	K	0~800	导热板材料: 不锈钢或紫铜 Material of heat conduction shield: stainless steel or red copper 安装板材料: 不锈钢或镀锌板 Material of mounting panel: stainless steel or red copper 可供范围: Φ50—Φ80 Range: Φ50—Φ80			 <div>卡箍式 Clip type 热电偶、热电阻 Thermocouple, thermal resistance</div>
WRET-031G WRET <sub>2</sub> -031G	E	0~600				
WZPT-031G WZPT <sub>2</sub> -031G	Pt100	-70~400				

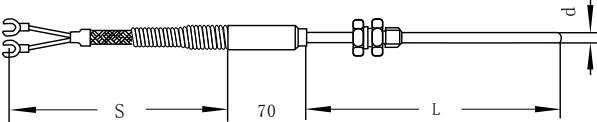
注: (1) 集热板曲率半径“R”可根据管道直径供货, 并由用户四点焊接或用螺钉固定在被测物体表面。集热板的具体安装尺寸及规格参见94页, 图159、图160。(2) 导线延长式, 尾线长度“S”常规附带500mm, 若需要增加, 请注明尾线长度。(3) 热响应时间t<sub>0.5</sub>(s) 热电偶≤2.5或≤4; 热电阻≤5或≤8。

(1) The radius of curvature of the collecting plate “R” shall be provided according to the tube diameter, which shall be fixed on the surface of the measured object through four points welding or screw by customers. See Page 94, Fig 159 and 160 for the detailed installation dimension and specification of collecting plate. (2) 500mm buttcock line is usually attached to the extension wire type “S”, if need to add, please indicate the length. (3) The thermal response time is 0.5(s), thermocouple ≤2.5 or ≤4; the thermal resistance ≤5 or ≤8.

## 铠装热电偶、铂热电阻（带固定卡套螺栓）

Sheathed thermocouple and platinum thermal resistance (with fixed ferrule bolt)

(图109 Fig 109)

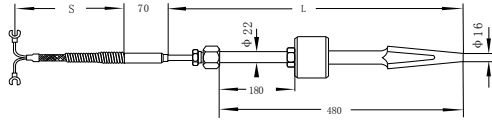
型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range(℃)	热响应时间 $\tau_{0.5}(s)$ Thermal Response Time $\tau_{0.5}(s)$	d(mm)	L(mm)	
WRNT-21 WRNT <sub>2</sub> -21	K	0~800	$\leq 2.5$ or $\leq 4$	$\phi 3$ $\phi 4$ $\phi 5$ $\phi 6$ $\phi 8$	500 1000 5000 8000 10000 15000 20000 25000	
WRET-21 WRET <sub>2</sub> -21	E	0~600				
WRTT-21 WRTT <sub>2</sub> -21	T	-40~+350				
WZPT-21 WZPT <sub>2</sub> -21	Pt100	-200~+500				

注：（1）导线延长式，线长度“S”常规附带500mm，若需增加，请注明长度。（2）卡套螺栓规格参见90页，图141。

Note: (1) 500mm is usually attached to the wire extension type “S”, if need to add, please indicate the length. (2) See the specification of ferrule bolt at page 90, Fig 141.

## 热套式热电偶铠装元件延长型Heat shielded thermocouple and sheathed elements extension type

(图110 Fig 110)

型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range(℃)	公称压力(Mpa) Nominal pressure (Mpa)	流速(m/s) Flow rate (m/s)	
WRNR-0131 WRNR <sub>2</sub> -0131	K	0~800	$\leq 30$	$\leq 80$	
WRER-0131 WRER <sub>2</sub> -0131	E	0~600			

注：（1）铠装元件引出长度“L”由用户自定。

（2）保护管材料1Cr18Ni9Ti。

（3）补偿导线型式、线长度“S”常规附带500mm，如需增加注明线长度。

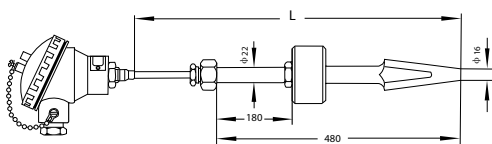
Note: (1) The length “L” leaded out of sheathed elements shall be determined by customers.

(2) Protection tube material 1Cr18Ni9Ti.

(3) 500mm lead wire is usually attached to the extension wiretype “S”, if need to add, please indicate the length.

## 热套式热电偶铠装元件延长型Heat shielded thermocouple and sheathed elements extension type

(图111 Fig 111)

型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range(℃)	公称压力(Mpa) Nominal Pressure (Mpa)	流速(m/s) Flow rate (m/s)	
WRNR-0133 WRNR <sub>2</sub> -0133	K	0~800	$\leq 30$	$\leq 80$	
WRER-0133 WRER <sub>2</sub> -0133	E	0~600			

注：（1）铠装元件引出长度“L”由用户自定。

（2）保护管材1Cr18Ni9Ti。

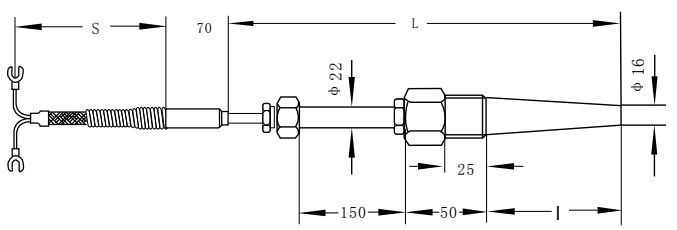
Note: (1) The length “L” leaded out of sheathed elements shall be determined by customers.

(2) Protection tube material shall be 1Cr18Ni9Ti.

# 固定螺栓锥形保护管式热电偶铠装元件延长型

Fixed bolt taper tube sheathed thermocouple elements extension type

(图112 Fig 112)

型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range (℃)	公称压力 (MPa) Nominal pressure (MPa)	置入深度 Placed depth		
				L		
WRNR-1531 WRNR <sub>2</sub> -1531	K	0~800	≤30	75	100	
WRER-1531 WRER <sub>2</sub> -1531	E	0~600		150	200	
				250	300	
				350	400	
				450	500	

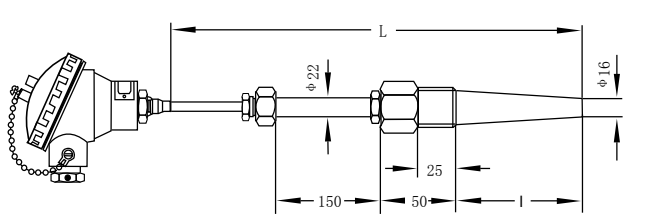
注：（1）WR□R-1531、WR□R1533不加尾注为M33×2螺栓；加A为NPT1螺栓；加B为M33×2螺栓带齿形垫片规格参见93页，图152。  
（2）铠装元件引出长度“L”由用户自定。（3）保护管材料1Cr18Ni9Ti。（4）补偿导线式，线长长度“S”常规附带500mm，若须增加注明长度。

Note: (1) WR□R-1531 and WR□R1533 model without endnote are M33×2 bolt and with B is M33×2 bolt with serrated washer. See the specification on page 93 Fig 152. (2) The length “L” leaded out of sheathed elements shall be determined by customers. (3) Protection tube material 1Cr18Ni9Ti. (4) 500mm is usually attached to extension wire type “S”, if need to add, please indicate the length.

# 固定螺栓锥形保护管式热电偶铠装元件延长型

Fixed bolt taper tube sheathed thermocouple elements extension type

(图113 Fig 113)

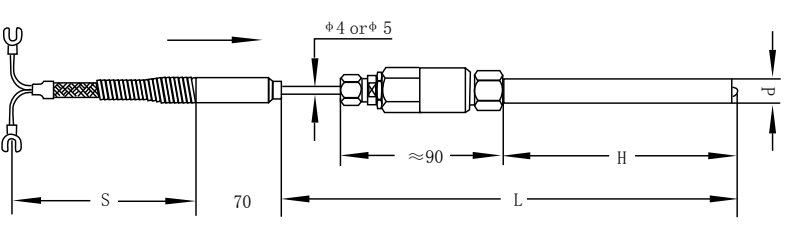
型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range(℃)	公称压力 (MPa) Nominal pressure (MPa)	置入深度 Placed depth		
				L		
WRNR-1533 WRNR <sub>2</sub> -1533	K	0~800	≤30	75	100	
WRER-1533 WRER <sub>2</sub> -1533	E	0~600		150	200	
				250	300	
				350	400	
				450	500	

注：（1）WR□R-1531、WR□R1533不加尾注为M33×2螺栓；加A为NPT1螺栓；加B为M33×2螺栓带齿形垫片规格参见93页，图152。  
（2）铠装元件引出长度“L”由用户自定。  
（3）保护管材料1Cr18Ni9Ti。

Note: (1) WR□R-1531 and WR□R1533 model without endnote are M33×2 bolt and with B is M33×2 bolt with serrated washer. See the specification on page 93, Fig 152.  
(2) The length “L” leaded out of sheathed elements shall be determined by customers.  
(3) Protection tube material 1Cr18Ni9Ti.

# 铠装热电偶（带防震引出管）Sheathed thermocouple (with anti-vibration extraction tube)

(图114 Fig 114)

型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range (℃)	引出管 (mm) Extraction tube (mm)		
			d	H	
WRNK-91FZ WRNK <sub>2</sub> -91FZ	K	0~800	φ 12 φ 16 φ 20 φ 22	200	
				300	
				400	
				500	
				600	
WREK-91FZ WREK <sub>2</sub> -91FZ	E	0~600		700	
				800	

注：（1）主要用于测量管道金属表面的温度，引出管带有防震紧顶结构。能使元件的测量端部与被测面始终保持紧密的接触。

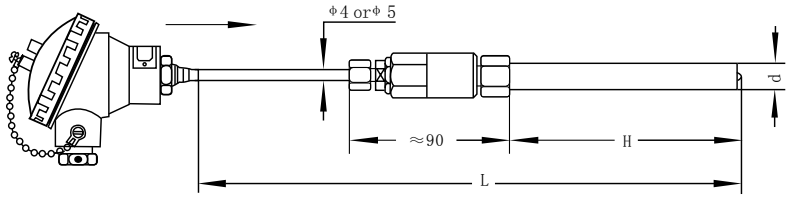
（2）引出管的高度“H”，铠装热电偶的长度“L”和延长导线“S”的尺寸由用户根据需要自定。

Note: (1) It is usually used measure the temperature of the metal surface of the pipelines. The extraction tube is equipped with anti-vibration tight-top structure to ensure the elements close contact with the measured face when measuring.  
(2) The height “H” of the extraction tube, the length “L” of sheathed thermocouple and the dimension of the extension lead wire “S” shall be determined by users’ need.



铠装热电偶（带防震引出管） Sheathed thermocouple (with anti-vibration extraction tube)

(图115 Fig 115)

型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range (℃)	引出管 (mm) Extraction tube (mm)		
			d	H	
WRNK-93FZ WRNK <sub>2</sub> -93FZ	K	0~800	φ12 φ16 φ20 φ22	200 300 400 500 600 700 800	
WREK-93FZ WREK <sub>2</sub> -93FZ	E	0~600			

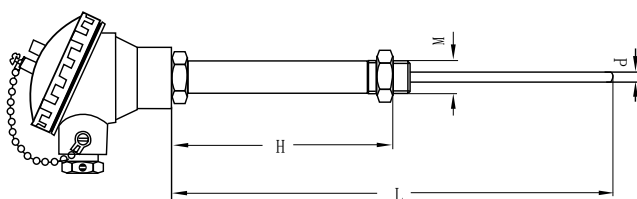
注：（1）主要用于测量管道金属表面的温度，引出管带有防震紧顶结构。能使元件的测量端部与被测面始终保持紧密的接触。（2）引出管的高度“H”，铠装热电偶的长度“L”由用户根据需要自定。

Note: (1) It is usually used measure the temperature of the metal surface of the pipelines. The extraction tube is equipped with anti-vibration tight-top structure to ensure the elements close contact with the measured face when measuring. (2) The height “H” of the extraction tube and the length “L” of sheathed thermocouple shall be determined by users’ need.

固定套管式铠装热电偶、铂热电阻

Fixed extension type sheathed thermocouple and platinum thermal resistance

(图116 Fig 116)

型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range (℃)	规格 Specification		
			M	H (mm)	
WRNT-53T WRNT <sub>2</sub> -53T	K	0~800	M20×1 M22×1 G1/2" G3/4"	130 150 180 200	
WZPT-53T WZPT <sub>2</sub> -53T	Pt100	-70~500			

注：（1）安装螺栓“M”能同各种有内螺纹的保护套配接，能任意方向安装。

（2）采用铠装元件，测量端能同保护套内端面有效的紧密接触。

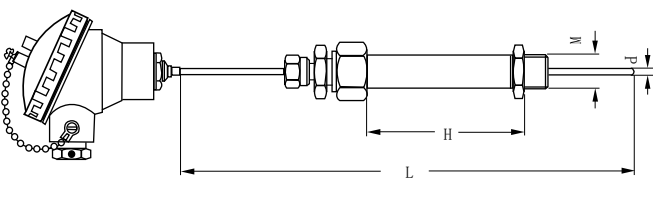
Note: (1) Mounting bolt “M” shall be applicable to all kinds of protecting jacket with internal thread and available in all direction.

(2) It adopts the sheathed elements to ensure the measuring terminal actively close contact with the internal end face of the protecting jacket.

活动套管式铠装热电偶、铂热电阻

Movable extension type sheathed thermocouple and thermal resistance

(图117 Fig 117)

型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range (℃)	规格 Specification		
			d	H	
WRNT-33HJT WRNT <sub>2</sub> -33HJT	K	0~800	M16×1 M20×1 M22×1 G1/2" G3/4"	130 150 180 200	
WZPT-33HJT WZPT <sub>2</sub> -33HJT	Pt100	-70~500			

注：（1）安装螺栓“M”能同各种有内螺纹的保护套配接，能任意方向安装。

（2）铠装元件的长度“L”和引出管的高度“H”由用户根据需要自定。

Note: (1) Mounting bolt “M” shall be applicable to all kinds of protecting jacket with internal thread and available in all direction.

(2) The height “H” of the extraction tube and the length “L” of sheathed thermocouple shall be determined by users’ need.

固定螺栓直形保护管式热电偶、铂热电阻、铠装元件延长型

(图118 Fig 118)

Fixed Screw In Type TC And RTD With Straight Protection Tube And Extensible MITC And MIRTD Element

型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range(℃)	规格 Specification	
			d	l
WRNR-231631 WRNR <sub>2</sub> -231631	K	0~800	φ 16	100 450
WRER-231631 WRER <sub>2</sub> -231631	E	0~600		150 500
WZPR-231631 WZPR <sub>2</sub> -231631	Pt100	-200~+500		200 750
				250 1000
				300 1250
WZPR-231231 WZPR <sub>2</sub> -231231			φ 12	350 1500
				400 2000

Technical drawing of a fixed screw-in type thermocouple or RTD. The drawing shows a cross-section of the device with dimensions: S (cable length), 70 (thread length), 150 (flange diameter), L (extension length), and P (thread pitch).

- 注：（1）公称压力：10MPa。  
 （2）保护管材料：1Cr18Ni9Ti。  
 （3）导线延长式，尾线长度“S”常规附带500mm，若需增加请注明尾线长度。  
 （4）铠装元件引出长度“L”由用户自定。  
 （5）直形保护管固定螺栓规格参阅第91页，图147。

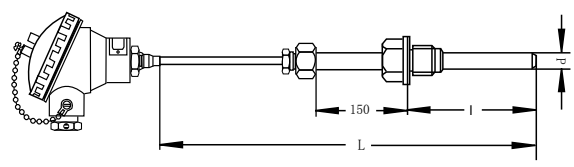
- Note: (1) Normal Pressure:10MPa.  
 (2) Protection Tube Material:1Cr18Ni9Ti.  
 (3) Extension cable regularly comes with 500mm end cable “S”. Please specify the length of end cable, if different.  
 (4) User specifies the extension length of MITC and MIRTD element.  
 (5) Refer to page 91, Fig 147 for specification of fixed screw-in straight protection tube.

固定螺栓直形保护管式热电偶、铂热电阻、铠装元件延长型

(图119 Fig 119)

Fixed Screw-In Type TC And RTD With Straight Protection Tube And Extensible MITC And MIRTD Element

型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range(℃)	规格 Specification	
			d	l
WRNR-231633 WRNR <sub>2</sub> -231633	K	0~800	φ 16	100 450
WRER-231633 WRER <sub>2</sub> -231633	E	0~600		150 500
WZPR-231633 WZPR <sub>2</sub> -231633	Pt100	-200~+500		200 750
				250 1000
				300 1250
WZPR-231233 WZPR <sub>2</sub> -231233			φ 12	350 1500
				400 2000



- 注：（1）公称压力：10MPa。  
 （2）保护管材料：1Cr18Ni9Ti。  
 （3）铠装元件引出长度“L”由用户自定。  
 （4）直形保护管固定螺栓规格参阅第91页，图147。

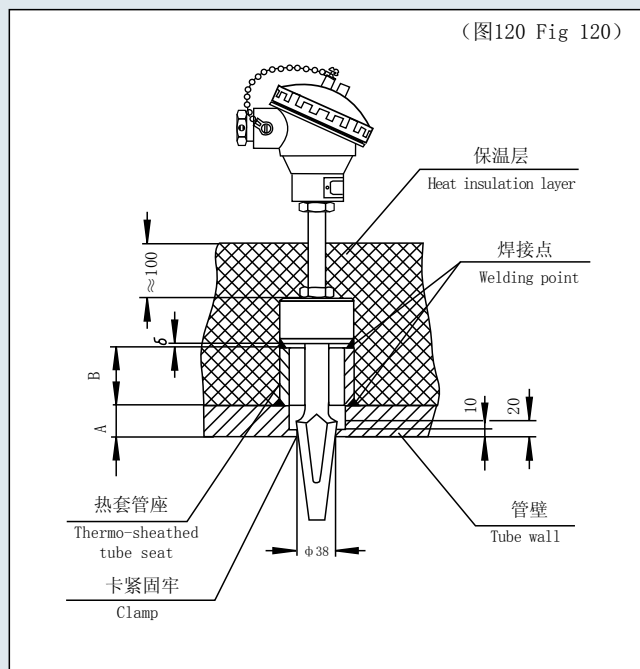
- Note: (1) Normal Pressure:10MPa.  
 (2) Protection Tube Material:1Cr18Ni9Ti.  
 (3) User specifies the extension length of MITC and MIRTD element.  
 (4) Refer to page 91, Fig 147 for specification of fixed screw-in straight protection tube.

# 电站测温用热电偶、热电阻安装示意图

## INSTALLATION FIGURE OF TC AND RTD USED IN POWER STATION

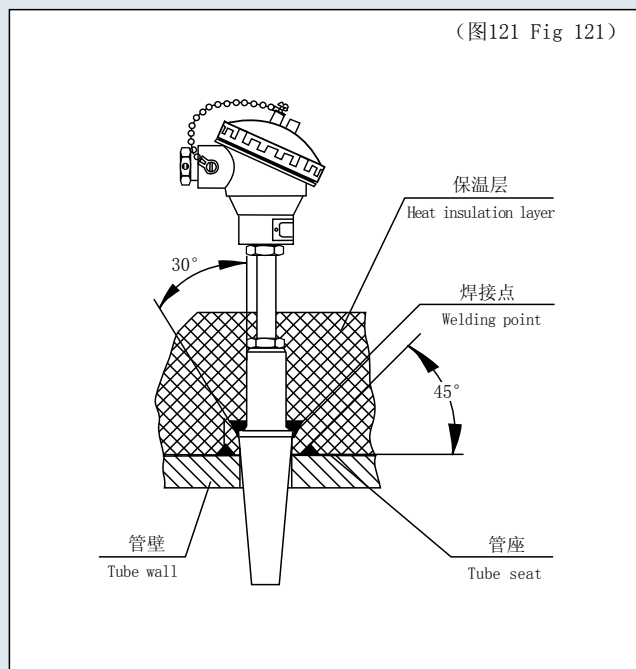
### 01型热套式热电偶、热电阻安装结构示意图

Installation Figure Of Thermo-Sheathed Type 01  
TC And RTD



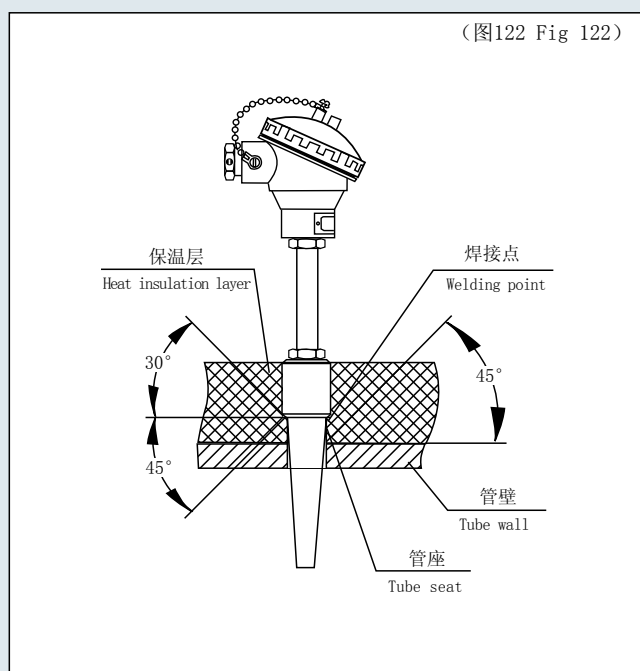
### 13型热电偶、热电阻安装结构示意图

Installation Figure Of Type 13 TC And RTD



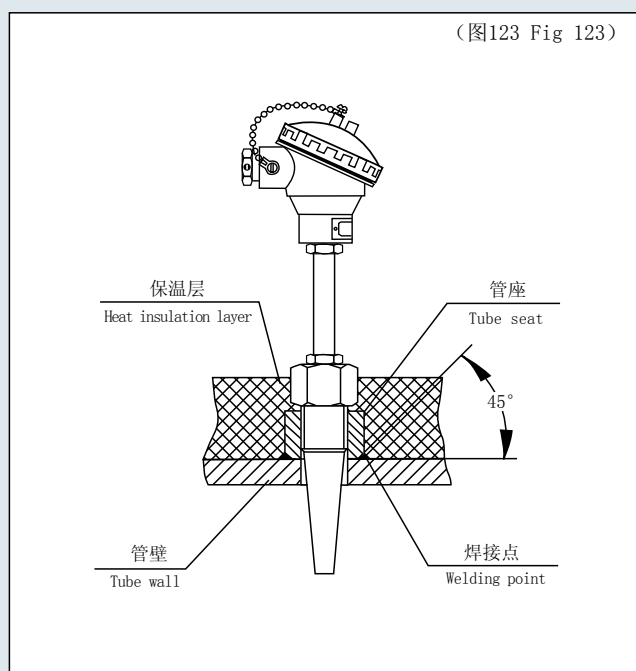
### 14型热电偶、热电阻安装结构示意图

Installation Figure Of Type 14 TC And RTD



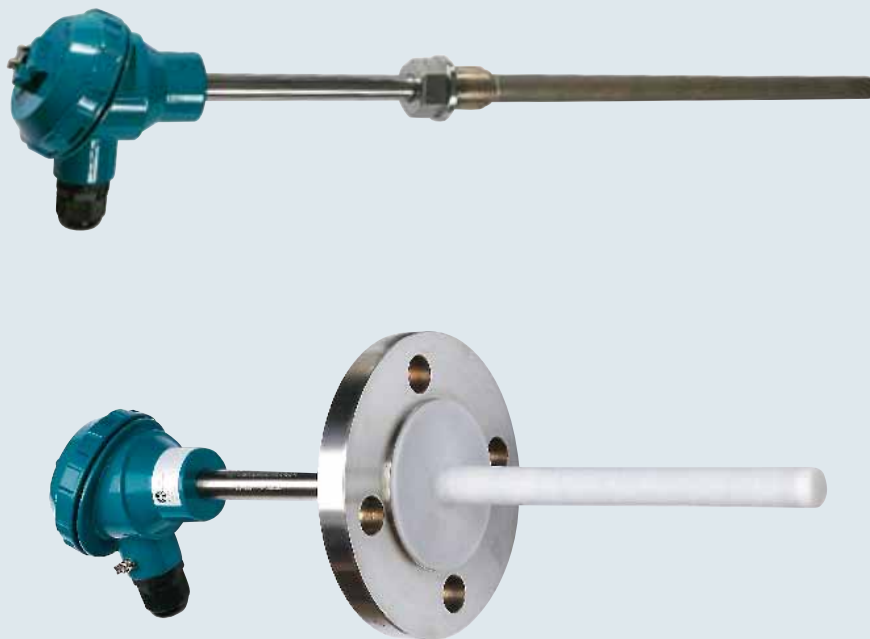
### 15型热电偶、热电阻安装结构示意图

Installation Figure Of Type 15 TC And RTD



## 特种热电阻、热电偶

## Special thermal resistance and thermocouple



### 耐磨型热电偶、热电阻Abrasion-proof thermocouple and thermal resistance

沸腾炉、循环流化床炉，水泥回转窑窑尾温度高，且有流动物料磨损，并有多种有害气体的腐蚀，使用一般温度传感器往往需频繁地更换，不但增加仪表工的劳动强度和生产成本，且给安全生产带来了较大隐患。近年来从保护管和测温元件上进行了改进，研制出了高温耐磨热电偶，有效的提高了使用期和测温的可靠性，较好地解决了以上的问题。

Because of the high temperature in the charge end of furnace in fluid bed, circulating fluid bed and cement rotary kiln, the wear of the material flow and the corrosion caused by diversified harmful gases, the temperature sensor always needs to be changed frequently, which not only increases the labour intensity of instrument workers and production cost but brings about serious hidden danger. In these years, the development of high temperature abrasion-proof thermocouple based on the improvement on the protection tube and temperature measurement elements efficiently improves the lifetime and thermometric reliability of the sensor and perfectly solves the above problems.

### 高温耐磨型热电偶、热电阻High abrasion-proof thermocouple and thermal resistance

采用特种工艺和特种耐磨合金材料保护管，其硬度达到HRC85~90，具有优良的耐磨及耐腐蚀性能。适用于电站循环流化床锅炉（CFB）温度，一次风煤粉混合温度，磨煤机的进出口温度和制粉系统温度的测量。以及石油裂解温度、建筑沥青混合物温度，流动粉末、粒子物温度的测量。

Adopting the special technology and abrasion-proof alloy material protection tube with its degree of hardness up to HRC85~90 and having the good performance in abrasion-proof and corrosion-resisting, they are applicable to the temperature measurement of the circulating fluid bed boiler (CFB) of power plant, the mixing temperature of coal dust caused by primary air flow, the inlet and outlet of the coal grinding machine, the pulverizing system, the petroleum cracking, the building asphalt mixture and the flow dust and particle.

本系列电偶主要用于流化床炉、沸腾炉、煤粉炉、水泥回转窑测温，也可用于其它同等工况的场合。

The thermocouple of this series is mainly used to the temperature measurement of fluidized bed furnace, furnace in fluid bed and coal dust furnace. They are also available under other same working conditions.

## 热电偶、铂热电阻温度范围及允差

Temperature range and difference of the thermocouple and platinum thermal resistance

(表32 Table 32)

类型 Type	分度号 Graduation Mark	型号 Model	温度范围 (°C) Temperature Range	允差等级 Allowance Grade		允差等级 Allowance Grade	
热电偶 Thermocouple	S	WRP	0~1600	1级 1Grade	1°C或±[1+0.003(t-1100)]°C 1°C or ±[1+0.003(t-1100)]°C	2级 2Grade	±1.5°C或±0.0025· t  ±1.5°C or ±0.0025· t
热电偶 Thermocouple	K	WRK	-40~+1200	1级 1Grade	±1.5°C or ±0.004 ±1.5°C or ±0.004	2级 2Grade	±2.5°C或±0.0075· t  ±2.5°C or ±0.0075· t
热电偶 Thermocouple	E	WRE	-40~+800	1级 1Grade	±1.5°C or ±0.004 ±1.5°C or ±0.004	2级 2Grade	±2.5°C或±0.0075· t  ±2.5°C or ±0.0075· t
铂热电阻 Platinum thermal resistance	Pt100	WZP	-200~+500	A级 1Grade	±(1.5+0.002· t )	B级 2Grade	±(0.30+0.005· t )

注: |t|为测量端温度t的绝对值。Note: |t| is the absolute value of the measured end temperature.

## 热电偶的偶丝和推荐使用的最高温度

Thermocouple wire and its recommended maximum temperature for using

(表33 Table 33)

分度号 Graduation Mark	偶丝直径 (mm) Diameter of thermocouple wire	0.3	0.5	0.8	1.0	1.2	1.6	2.0	2.5	3.2
S	长期使用最高温度 (°C) Maximum temperature for long-term use	-	1300	-	-	-	-	-	-	-
S	短期使用最高温度 (°C) Maximum temperature for Short-term use	-	1600	-	-	-	-	-	-	-
K	长期使用最高温度 (°C) Maximum temperature for long-term use	700	800	900	900	1000	1000	1100	1100	1200
K	短期使用最高温度 (°C) Maximum temperature for Short-term use	800	900	1000	1000	1100	1100	1200	1200	1300
E	长期使用最高温度 (°C) Maximum temperature for long-term use	350	350	450	450	450	550	550	650	750
E	短期使用最高温度 (°C) Maximum temperature for Short-term use	450	450	550	550	550	650	650	750	900

注: 热电偶的长期使用温度极限与偶丝直径有关, 丝径愈粗, 使用温度愈高。

Note: The maximum temperature for long-term use of thermocouple is up to its diameter. The thicker the wire is, the higher the temperature for use will be.

## 铠装热电偶 (绝缘型) 材料及使用的最高温度

Material of sheathed thermocouple (insulating type) and its maximum temperature for use

(表34 Table 34)

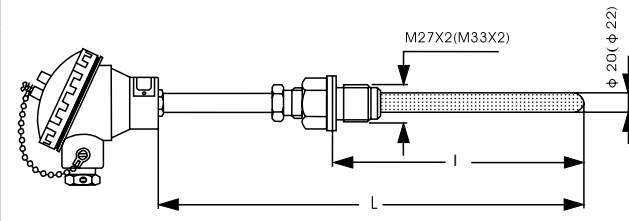
分度号 Graduation Mark	套管材料 (牌号/代号) Sheathed tube material (Brand/Code)	直径 d (mm) Diameter	长期使用最高温度 (°C) Maximum temperature for long-term use	短期使用最高温度 (°C) Minimum temperature for short-term use
S	GH3030	5.0, 6.0, 8.0	1100	1200
K	GH3030、310S	4.0, 5.0	1000	1100
K	GH3030、310S	6.0, 8.0	1100	1200
K	1Cr18Ni9Ti、304、316	4.0, 5.0, 6.0, 8.0	800	900
E	1Cr18Ni9Ti、304、316	3.0, 4.0, 5.0, 6.0	600	700

注: 热电偶的长期使用温度极限与偶丝直径有关, 丝径愈粗, 使用温度愈高。

Note: The maximum temperature for long-term use of thermocouple is up to its diameter. The thicker the wire is, the higher the temperature for use will be.

高耐磨型热电偶、热电阻High abrasion-proof thermocouple and thermal resistance

(图124 Fig 124)

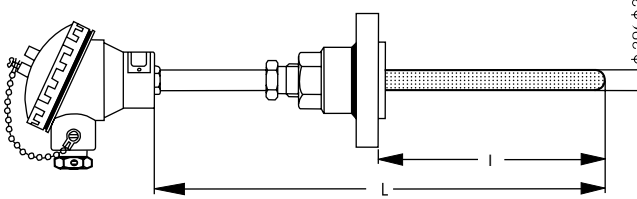
型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range(℃)	规格 Specification		
			L	X I	
WRNHAR-02 WRNHAR <sub>2</sub> -02	K	0~800 *0~1000	300×150		
WRNHAR-02 WRNHAR <sub>2</sub> -02			350×200		
WRNHAR-02 WRNHAR <sub>2</sub> -02			400×250		
WRNHAR-02 WRNHAR <sub>2</sub> -02			450×300		
WREHAR-02 WRNHAR <sub>2</sub> -02	E	0~600	550×400		
WREHAR-02 WRNHAR <sub>2</sub> -02			650×500		
WZPHAR-02 WZPHAR <sub>2</sub> -02	Pt100	0~500	900×750		
WZPHAR-02 WZPHAR <sub>2</sub> -02			1000×850		
			1200×1050		

注：（1）内芯均为铠装元件。\*内芯的保护管材料为耐高温合金不锈钢。（2）直形保护管固定螺栓规格参见91页，图147。

Note: (1) The inner core shall be sheathed elements. The protection tube material of the inner core shall be high temperature alloy stainless steel. (2) See page 91, table 147 for the specification of the straight lined protection tube fixed bolt.

高耐磨型热电偶、热电阻High abrasion-proof thermocouple and thermal resistance

(图125 Fig 125)

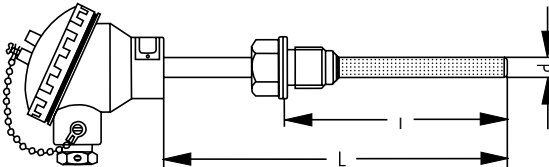
型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range(℃)	规格 Specification		
			L	X I	
WRNHAR-04 WRNHAR <sub>2</sub> -04	K	0~800 *0~1000	300×150		
WRNHAR-04 WRNHAR <sub>2</sub> -04			350×200		
WRNHAR-04 WRNHAR <sub>2</sub> -04			400×250		
WRNHAR-04 WRNHAR <sub>2</sub> -04			450×300		
WREHAR-04 WRNHAR <sub>2</sub> -04	E	0~600	550×400		
WREHAR-04 WRNHAR <sub>2</sub> -04			650×500		
WZPHAR-04 WZPHAR <sub>2</sub> -04	Pt100	0~500	900×750		
WZPHAR-04 WZPHAR <sub>2</sub> -04			1000×850		
			1200×1050		

注：（1）内芯均为铠装元件。\*内芯的保护管材料为耐高温合金不锈钢。（2）型号后面加“A”为ANSI标准法兰。选用JB/T标准法兰，参见92页，图150。

Note: (1) The inner core shall be sheathed elements. The protection tube material of the inner core shall be high temperature alloy stainless steel. (2) Model with “A” at the end shall be ANSI standard flange. If the JB/T standard. flange is used, See page 92, Fig 150.

耐磨型热电偶、铂热电阻Abrasion-proof thermocouple and platinum thermal resistance

(图126 Fig 126)

型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range(℃)	规格 Specification		
			d	L x I	
WRNN-23220TH WRNN <sub>2</sub> -23220TH	K	*0~1000	Φ 20	300×150 350×200 400×250 450×300 550×400 650×500 900×750 1150×1000 1650×1500 2150×2000	
WRNN-23225TH WRNN <sub>2</sub> -23225TH	K	*0~1000	Φ 25		
WREN-23220TH WREN <sub>2</sub> -23220TH	E	0~600	Φ 20		
WREN-23225TH WREN <sub>2</sub> -23225TH	E	0~600	Φ 25		
WZPN-23220TH WZPN <sub>2</sub> -23220TH	Pt100	0~500	Φ 20		

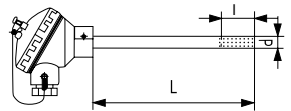
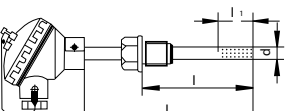
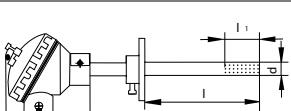
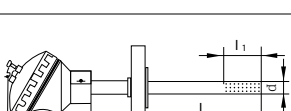
注：（1）\*保护管材料为耐高温合金不锈钢。采用复合型耐温材料。（2）直形保护管固定螺栓规格参见91页，图147。

Note: (1) The protection tube material of the inner core shall be composite material of high temperature alloy stainless steel. (2) See page 91, Fig 147 for the specification of the straight lined protection tube fixed bolt.



## 高温耐磨热电偶High temperature abrasion-proof thermocouple

(图127 Fig 127)

型 号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range(℃)	保护管规格 (mm) Specification of protection tube (mm) $l_1$		公称压力 (MPa) Nominal pressure (MPa)	图示 Diagrammatic view
			d	$l_1$		
WRN-13□N-K WRN <sub>2</sub> -13□N-K	K	0~1300	Φ 18 Φ 22 Φ 25 Φ 32	300 350 400 450 500	常压 Normal pressure	 无固定装置 Non-fixing device
WRN-23□N-K WRN <sub>2</sub> -23□N-K					10	 固定螺栓式 Fixed bolt type
WRN-33□N-K WRN <sub>2</sub> -33□N-K					常压 Normal pressure	 活动法兰式 Movable flange type
WRN-43□N-K WRN <sub>2</sub> -43□N-K					2.5	 固定法兰式 Fixed flange type

注：（1）型号中□表示保护管的外径，用户可根据所选外径Φ18 Φ22 Φ25和Φ32分别选用。（2）型号中-K表示使用铠装内芯元件。（3） $l_1$ 为耐磨合金保护管的长度，由插入炉膛的长度而定，通常 $l_1$ 为300mm~500mm。（4）固定螺栓和法兰规格参见91页，图147，92页，图150、图151。

Note: (1) The mark □ in the model stands for the outer diameter of protection tube. Customers are free to choose Φ18, Φ22, Φ25 or Φ32. (2) K in the model stands for the sheathed inner core elements. (3)  $l_1$  in the model stands for the length of the abrasion-proof resist alloy protection tube determined by the length in the furnace tank.  $l_1$  usually stands for 300mm~500mm. (4) See page 91, Fig 147, page 92, Fig 150 and 151 for the specification of fixed bolt and flange.

## 高温盐浴炉用热电偶High temperature salt bath furnace thermocouple

采用粉末冶金工艺制成的金属陶瓷管具有优良的耐腐蚀、耐高温性能，用于机械行业高温盐浴炉连续测温。

It is produced by adopting power metallurgical technique and has a good performance in corrosion resistant and high temperature resistant, which can be used to continually take the temperature measurement on the high temperature salt bath furnace.

BaCl<sub>2</sub>熔盐: 1280℃ 寿命>1400小时

BaCl<sub>2</sub> fused salt: 1280℃ length of life >1400 hours

BaCl<sub>2</sub>+NaCl 熔盐: 1000℃ 寿命>1500小时

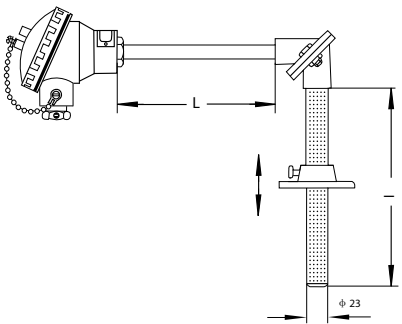
BaCl<sub>2</sub>+NaCl fused salt: 1000℃ length of life>1500 hours

KCl+NaCl 熔盐: 1050℃ 寿命>300小时

KCl+NaCl fused salt: 1050℃ length of life>300 hours

高温盐浴炉用热电偶High temperature salt bath furnace special thermocouple

(图128 Fig 128)

型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range(℃)	热响应时间 τ 0.5(s) Thermal response time τ 0.5(s)	规格 specification		
				L x I		
WRP-530MC	S	0~1300	≤180	500×500 750×750		
WRN-530MC	K	0~1200				
WRM-530MC	N	0~1200				

注：（1）公称压力为常压。（2）活动法兰规格参见92页，图151。

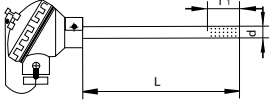
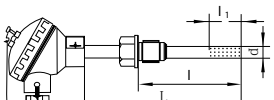
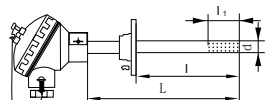
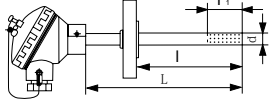
Note: (1) The nominal pressure shall be ordinary pressure. (2) See page 92, Fig 151 for the specification of flexible flange.

水泥回转窑用耐磨热电偶Cement rotary kiln abrasion-proof thermocouple

水泥回转窑有高温磨损，又有有害气体的腐蚀，是热电偶测温环境较差的场所。本系列产品具有耐高温、耐磨损、耐腐蚀等性能，可较好的用于水泥回转窑窑尾测温。本系列产品也可用于循环流化床的测温。

The thermocouple under the bad condition, such as cement rotary kiln, is likely to be influenced by its high temperature, wear and corrosion of harmful gases. The products of this series have a good performance in high temperature resistant, abrasion-proof resistant and corrosion resistant, which can be perfectly used to measure the temperature of cement rotary kiln charge end and also circulating fluid bed.

(图129 Fig 129)

型 号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range(℃)	保护管规格 (mm) Specification of protection tube (mm)		公称压力 (MPa) Nominal pressure (MPa)	图示 Diagrammatic view
			d	$l_1$		
WRN-13□N-K WRN <sub>2</sub> -13□N-K	K	0~1300	φ18 φ22 φ25 φ32	300 350 400 450 500	常压 Normal pressure	 无固定装置 Non-fixing device
WRN-23□N-K WRN <sub>2</sub> -23□N-K					9.8	 固定螺栓式 Fixed bolt type
WRN-33□N-K WRN <sub>2</sub> -33□N-K					常压 Normal pressure	 活动法兰式 Movable flange type
WRN-43□N-K WRN <sub>2</sub> -43□N-K					2.5	 固定法兰式 Fixed flange type

注：（1）型号中□表示保护管的外径，用户可根据所选外径φ18 φ22 φ25和φ32分别选用。（2）型号中-K表示使用铠装内芯元件。（3） $l_1$ 为耐磨合金保护管的长度，由插入炉膛的长度而定，通常 $l_1$ =插入炉膛深度+200mm。常规供货长度为：350mm。（4）固定螺栓和法兰规格参见91页，图147；92页，图150、图151。

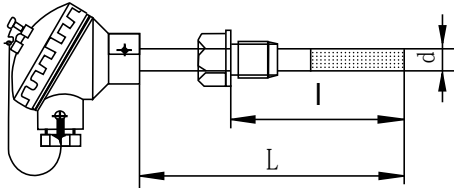
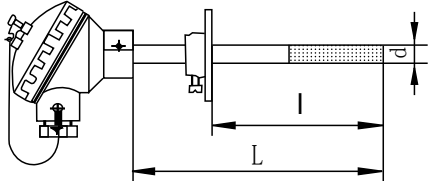
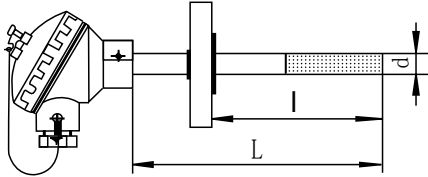
Note: (1) The mark □ in the model stands for the outer diameter of protection tube. Customers are free to choose φ18, φ22, φ25 or φ32. (2) K in the model stands for the sheathed inner core elements. (3)  $l_1$  is the length of wear-resistance alloy protection tube, which is usually depended on the length of insertion furnace.  $l_1$  = length of insertion furnace + 200mm. The normal length provided is 350mm. (4) See Page 91, Fig 147; Page 92, Fig150 and 151 for the specification of fixed screw bolt and flange.

## 低温耐磨型热电偶、热电阻 Low temperature abrasion-proof thermocouple and thermal resistance

本系列推出喷涂型和耐磨合金型两种。适用于温度稍低如煤磨用、有物料磨损的场所。喷涂型价格便宜，低温耐磨性能良好。耐磨合金型寿命长，成本稍高。

This series includes spraying and abrasion-proof resistant alloy types which can be used to the places with a low temperature, such as coal and material abrasion. The spraying type is low in price and abrasive in low temperature. The abrasion-proof resistant alloy type has a long lifetime but a higher price.

(图130 Fig 130)

型 号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range(℃)	公称压力 (MPa) Nominal pressure (MPa)	保护管规格 (mm) Specification of protection tube (mm)		图示 Diagrammatic view
				d	L	
WRN-230N-P WRN <sub>2</sub> -230N-K-P	K	0~400	10	φ 16	100 150 200 250 300 350 400 450 500 550 750 900 1000 1250 1500 2000	
WRE-230N-P WRE <sub>2</sub> -230N-K-P	E					<p>固定螺栓式fixing device</p>
WZP-230N-P WZP <sub>2</sub> -230N-K-P	Pt100					
WRN-330N-P WRN <sub>2</sub> -330N-K-P	K	0~400	常压			
WRE-330N-P WRE <sub>2</sub> -330N-K-P	E					<p>活动法兰式 Movable flange type</p>
WZP-330N-P WZP <sub>2</sub> -330N-K-P	Pt100					
WRN-430N-P WRN <sub>2</sub> -430N-K-P	K	0~400	2.5			
WRE-430N-P WRE <sub>2</sub> -430N-K-P	E					<p>固定法兰式 Fixed flange type</p>
WZP-430N-P WZP <sub>2</sub> -430N-K-P	Pt100					
WRN-43□N-H WRN <sub>2</sub> -43□N-K-H	K	0~400	2.5	φ 18 φ 20 φ 22 φ 25		
WRE-43□N-H WRE <sub>2</sub> -43□N-K	E					
WZP-43□N-H WZP <sub>2</sub> -43□N-K-H	Pt100					

注：（1）型号K表示使用铠装内芯元件，-P表示耐磨喷涂，耐磨长度一般为500mm，若需加长请订货时说明。-H表示硬质合金，耐磨长度通常为400mm，特殊规格需协议订货。（2）型号中□表示保护管的外径。（3）固定螺栓和法兰规格参见91页，图147；92页，图150、图151。

Note: (1) Y in the model stands for the sheathed inner core elements, P stands for abrasive spraying with a normal length of 500mm. If need add, please indicate in the order. H in the model stands for hard alloy with a normal length of 400mm. If need add, please indicate in the order. (2) The mark □ in the model stands for the outer diameter of protection tube. (3) See page 91, Fig 147; page 92, Fig 150 and 151 for the specification of fixed bolt and flange.

金属冶炼、建材窑炉测温用热电偶Temperature thermocouple used for metal refining or Kiln construction

在钢铁、冶金、水泥行业，除在一般环境中使用通用型热电偶、热电阻外，在一些特殊环境、特殊介质中，必须使用特制的专用测温热电偶，本系列产品为常用的，实际应用效果较好的热电偶。

In the industry, such as steel, metallurgy and cement, general thermocouple and thermal resistance are available. However, under some special environment and in some special mediums, the special designed temperature thermocouple shall be used. The products of this series are frequently used thermocouples with a perfectly practical application effect.

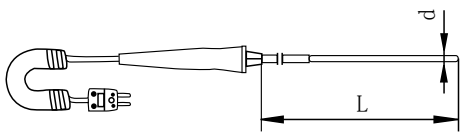
电解铝槽测温用热电偶Electrolytic aluminum tank temperature thermocouple

手柄式铠装热电偶与便携式数字测温仪配套测量电解铝槽中的温度，使用方便灵活、反应迅速。针对电解铝槽内温度高，介质腐蚀性强等特点，我公司除可提供多种外径、不同式样手柄的普通型热电偶外，还可提供复合型铠装热电偶，有效地延长了使用期限，在电解铝行业已得到了普遍认可和广泛应用。

It is used to measure the temperature of the electrolytic aluminum tank with handle sheathed thermocouple and portable digital thermometer, which is convenient, flexible and fast responsive. Considering the high temperature and strong corrosive medium in the tank, our company provides not only various normal thermocouples with different handle types but composite sheathed thermocouples, which have a longer lifetime and been approved and widely used by the electrolytic aluminum industry.

(图131 Fig 131)

型 号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range(℃)	套 管 Tube		测量端 形 式 Shape of the measuring terminal	
			材 质 Material	d(mm)		
WRNK-187 (2)	K	0~1000	1Cr18Ni9Ti	Φ 4 Φ 4.5 Φ 5 Φ 6	绝缘式 Insulator	
WRNK-188 (2)		0~1100	316 (L)		接壳式 Shell-connecting type	
WREK-187 (2)	E	-40~600	1Cr18Ni9Ti		绝缘式 Insulator	
WREK-188 (2)					接壳式 Shell-connecting type	



圆手柄型    Yound handle type

注：（1）订货时请注明型号，长度L和引线长度、手柄型式等。（2）常规供货为：L=1米，引线长度1米。（3）括号（2）表示双层保护管热电偶。

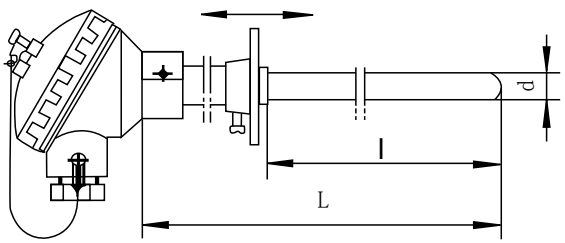
Note: (1) Please indicate the model, length, lead length and handle type in order. (2) For normal order: L=1 meter and Lead length=1 meter. (3) The parenthesis (2) stands for double layer protection tube thermocouple.

回转窑烟道用热电偶Rotary kiln flue thermocouple

回转窑烟道温度高，有有害气体腐蚀。我公司使用特制的复合管和绝缘管，使用效果很好。

The special designed multiple unit tube and insulating tube can be effectively used to the rotary kiln flue with high temperature and harmful gas corrosion.

(图132 Fig 132)

型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range(℃)	规格 Specification			图示 Diagrammatic view
			d(mm)	材质 Material	L×I (mm)	
WRN-332T	K	0~1200	Φ 16	高铝质 High Al2O3 刚玉质 Corundum	550×400 600×450 650×500 700×550 750×600 800×750 1000×850 1150×1000	
WRN-333T		0~1300	Φ 20			
WRN-334T			Φ 25			

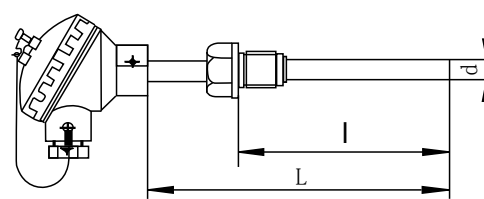
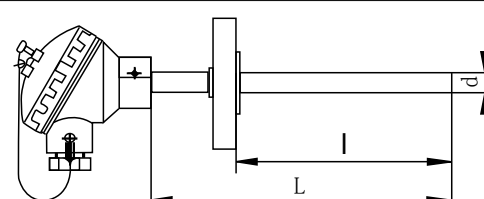
活动法兰式 Movable flange type

注：（1）订货时请注明型号、保护管材质和长度（L×I）。（2）法兰规格参见92页，图151。

Note: (1) Please indicate the model, protection tube material and length (L×I). (2) See page 92, Fig 151 for the specification of flange.

回转窑窑头用热电偶 Rotary kiln hood thermocouple

(图133 Fig 133)

型号 Model	分度号 Graduation Mark	测量范围(℃) Measuring Range(℃)	公称压力 (MPa) Nominal pressure (MPa)	规格 Specification			图示 Diagrammatic view
				d(mm)	保护管 材 质 Protection tube material	L×I (mm)	
WRN-236 WRN <sub>2</sub> -236	K	0~850	10	Φ 22	1Cr18Ni9Ti	250×100 300×150 350×200 400×250 450×300 500×350 550×400 600×450 650×500 700×550 750×600 800×750 1050×900 1150×1000 1400×1250 1650×1500 2150×2000	
WRN-236 WRN <sub>2</sub> -236		0~1000			1Cr25Ni20		
WRN-436 WRN <sub>2</sub> -436	K	0~850	2.5		1Cr18Ni9Ti		
WRN-436 WRN <sub>2</sub> -436		0~1000			1Cr25Ni20		

注：(1) 订货时请注明型号、保护管材质和长度(L×I)。

(2) 固定螺栓和固定法兰规格参见91页，图147；92页，图150。

Note: (1) Please indicate the model, protection tube material and length (L×I).

(2) See page 91, Fig 147 and page 92, Fig 150 for the specification of fixed bolt and flange.

### 耐腐蚀热电偶、热电阻 Corrosion resistant thermocouple

在热电偶、热电阻的保护管上喷涂或电镀某些防腐材料，或直接使用耐腐蚀合金材料制造保护管，令其具有较强的耐酸、碱、盐等介质腐蚀能力。可适用于冶金、石油、化工、机械、染化、纺织、农药、环保等工业部门。

By spraying or electric plating some anticorrosive materials on the protection tube of thermocouple or directly manufacturing protection tube with anticorrosive materials, the corrosion resistant thermocouple can be applicable to the industrial segments, such as metallurgy, petroleum, chemical engineering, mechanics, variegate, textile, agricultural pesticides and environment protection.

### 聚四氟乙烯防腐层 Anticorrosion of insulation of PTFE

采用热熔烧结加工工艺，将聚四氟乙烯 (PTFE) 的套管和螺栓 (或法兰) 均匀地套在不锈钢保护管的外层。聚四氟乙烯它具有优异的化学稳定性、耐磨性、耐蚀性、润滑性以及耐热性和耐寒性，聚四氟乙烯的磨擦系数最低，几乎不吸水，耐腐蚀性突出，能耐沸腾的盐酸、硫酸、硝酸及王水等腐蚀介质的腐蚀。

The sheathed tube and bolt (or flange) of PTFE is evenly cased on the outer layer of the stainless steel protection tube using hot sintering technology. PTFE has a series of fine characteristics such as chemical stability, wear resistance, lubricity, corrosion resistance, heat durability and cold resistance. PTFE has the minimum coefficient of friction, little water absorption, fine wear resistance and good corrosion proof properties to boiling hydrochloric acid, sulfuric acid, nitric acid and aqua regia.

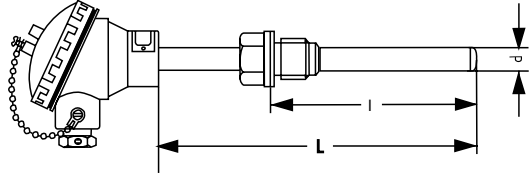
### 型号与规格 Model and specification

在装配式热电偶、热电阻产品型号后加尾注“F”，即是耐腐蚀型，再注明防腐材料名称或代号，规格也与装配式产品相同只是增加了涂层或镀层厚度，测温范围也受涂层或镀层限制。

Add “F” immediately following the model of assembly type thermocouple and thermal resistance, which stands for corrosion proof type, and then the name or code of the corrosion material. Its specification is same to the assembly type but with additional coating layer or coating layer thickness and its temperature range is also controlled by the coating layer or plating coat.

固定螺栓式铂热电阻Fixed bolt platinum thermal resistance

(图134 Fig 134)

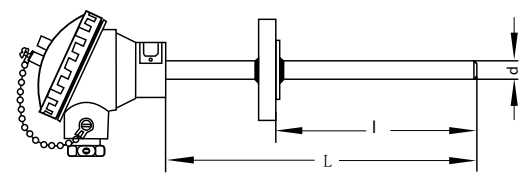
名称 Name	型号 Model	分度号 Graduation Mark	热响应时间 $\tau$ 0.5(s) Thermal response time $\tau$ 0.5(s)	测量范围(℃) Measuring Range(℃)	
铂热电阻 Platinum thermal resistance	WZPF-230 (PTFE)	Pt100	$\leq 120$	$-120^{\circ}\text{C} \sim +200^{\circ}\text{C}$	
	WZPF <sub>2</sub> -230 (PTFE)				

注：（1）PTFE表示聚四氟乙烯防腐层。（2）保护管固定螺栓规格参见91页，图147。

Note (1) PTFE stands for the anticorrosive coating of ploytetrafluoroethylene. (2) See page 91, Fig 147 for the specification of the straight lined protection tube fixed bolt.

固定法兰式铂热电阻Fixed flange platinum thermal resistance

(图135 Fig 135)

名称 Name	型号 Model	分度号 Graduation Mark	热响应时间 $\tau$ 0.5(s) Thermal response time $\tau$ 0.5(s)	测量范围(℃) Measuring Range(℃)	
铂热电阻 Platinum thermal resistance	WZPF-430 (PTFE)	Pt100	$\leq 120$	$-120^{\circ}\text{C} \sim +200^{\circ}\text{C}$	
	WZPF <sub>2</sub> -430 (PTFE)				

注：（1）PTFE表示聚四氟乙烯防腐层。

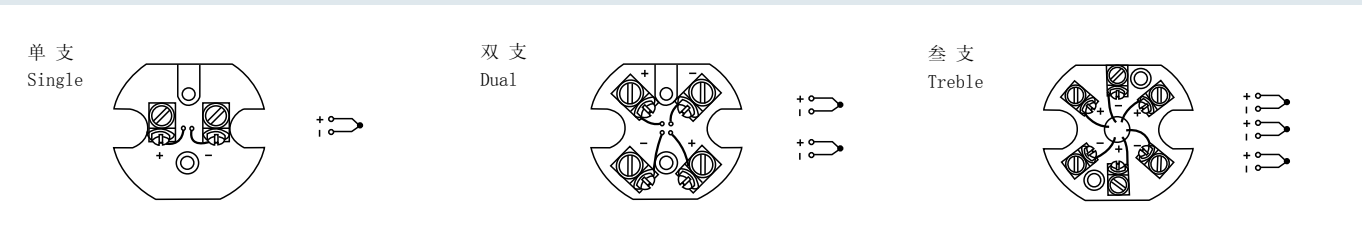
（2）固定法兰型号后加“A”，为ANSI标准法兰。规格参见92页，图150。

Note: (1) PTFE stands for the anticorrosive coating of ploytetrafluoroethylene.

(2) Fixed flange model with “A” at the end shall be ANSI standard flange. See page 92, Fig 150.

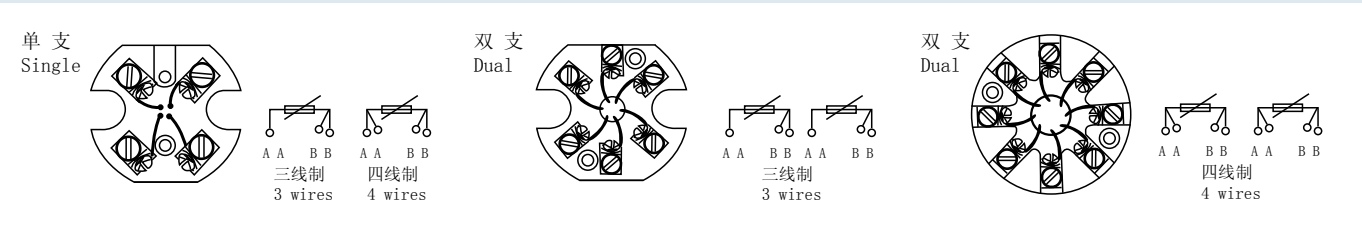
热电偶接线图Thermocouple wiring diagram

(图136 Fig 136)



热电阻接线图Thermal resistance wiring diagram

(图137 Fig 137)



## 一体化温度变送器

## Integration thermocouple and thermal resistance

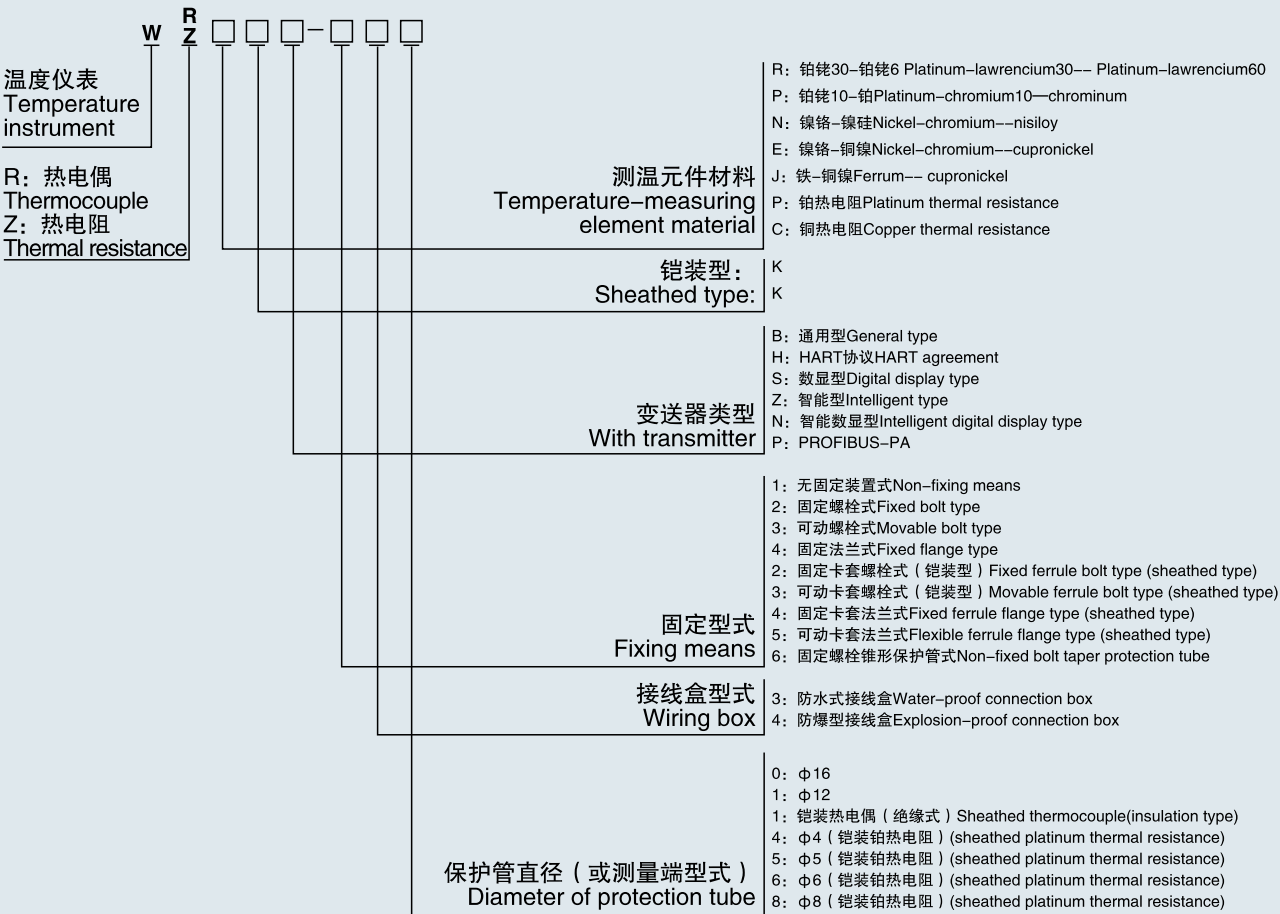
在普通装配式、隔爆式、铠装式热电偶、热电阻产品的接线盒内装入两线制变送器模块（SBWR, SBWZ）组成了具有温度检测和变送功能的一体化结构的热电偶、热电阻产品。可直接测量液体、气体或蒸汽介质的温度。它接受标准分度号的热电偶、热电阻输入信号，产生了被测温度成线性的4~20mA DC直流电流输出信号，与计算机系统配套，从而实现对各种温度的检测与控制。可广泛应用于电力、冶金、石油、化工、航空、机械、轻工、纺织、医药、食品、国防等工业部门的科研领域。

The integration structural thermocouple and thermal resistance products with the function of temperature measurement and transmission can be realized through putting the two wire system modules of transmitter (SBWR and SBWZ) into the connection box of the thermocouple and thermal resistance products, such as normal packaged type, explosion proof type and sheathed type. The integration production can be used to measure the temperature of liquid, gas or steam medium directly. It receives the input signals of the thermocouple and thermal resistance with standard graduation mark and generates the linear 4~20mA DC by the measured temperature. The temperatures are measured and controlled by the contact of the DC output signal and computer system. This temperature transmitter can be widely used to the scientific research field of the industrial sectors, such as electric power, metallurgy, petroleum, chemical engineering, aviation, mechanics, light industry, textile, medicine, food and national defense.





型号命名Type designation



热电偶、热电阻推荐测量范围Recommended measuring range of thermocouple and thermal resistance (表35 Table 35)

温度传感器类型 Type of temperature sensor	分度号 Graduation Mark	推荐测量范围(℃) Recommended Measuring Range(℃)
热电偶 Thermocouple	B	600~1600 800~1600 900~1800 1000~1600 1000~1800
	S	0~1300 0~1600 400~1600 600~1600 800~1400 800~1600 900~1400 1000~1400
	K	0~300 0~1600 0~800 0~1000 0~1300 400~800 400~1300 600~1300
	E	0~200 0~400 0~600 0~800 200~600 300~500 400~600
	J	0~200 0~400 0~600 300~600
	T	- 200~0 - 200~300 0~200 0~300
铂热电阻 Platinum thermal resistance	Pt100	- 200~+ 50 - 100~+ 50 - 50~+ 50 - 50~100 0~50 0~100 0~150 0~200 0~300 0~400 0~500 200~400 200~500
铜热电阻 Copper thermal resistance	Cu50	- 50~+ 50 - 50~+ 100 - 50~+ 150 0~50 0~100 0~+ 150

主要技术指标Major technical indexes

1. 输入信号: 热电偶:B、S、K、E、J、T。  
1 Input signal: Thermocouple: B, S, K, E, J, T.  
热电阻: Pt100、Cu50

Thermal resistance: Pt100、Cu50

2. 输出信号: 在量程范围内输出与温度成线性的4~20mA直流信号。

2 Output signal: 4~20mA DC signal is output within range lineal to temperature.

3. 基本精度: 热电偶温度变送器 $\pm 0.5\%F \cdot S$ ;

热电阻温度变送器 $\pm 0.2\%F \cdot S$ ;

3 Basic degree of accuracy: Thermocouple temperature transmitter $\pm 0.5\%F \cdot S$ ;

Thermal resistance temperature transmitter $\pm 0.2\%F \cdot S$ ;

4. 传输方式: 二线制。

4 Transmission model: Two wire system

5. 直流电源: 12~30V DC, 额定电压24V DC。

5 DC supply: 12~30V DC, rated voltage 24V DC

6. 负载阻抗:

极限负载电阻负载按下式计算:

$$R_L(\max) = 50(U - 12)$$

式中为变送器直流电源电压

在额定电压24V下:

$$R_L(\max) = 50(24 - 12) = 600 \Omega$$

6 Load impedance:

Calculate resistance load of limit load as follows;

$$R_L(\max) = 50(U - 12)$$

Among equation it is transmitter DC source voltage

Under 24V rated voltage:

$$R_L(\max) = 50(24 - 12) = 600 \Omega$$

7. 正常工作环境:

a. 环境温度:  $-25 \sim 85^\circ\text{C}$  (特殊要求为 $^\circ\text{C} - 40 \sim 90^\circ\text{C}$ )

b. 相对湿度: 5%~95%

c. 机械振动: 10~150HZ, A=0.15mm

d. 周围空气中不含有引起变送器腐蚀的介质

7 Normal operating environments

a. Ambient temperature:  $-25 \sim 85^\circ\text{C}$  (special requirement $^\circ\text{C} - 40 \sim 90^\circ\text{C}$ )

b. Relative temperature: 5%~95%

c. Mechanical vibration: 10~150HZ, A=0.15mm

d. Without any corrosive medium in the ambient air.

8. 电磁干扰: 当离开变送器0.5米处有20~1000MHz、5W功率的无线电发送器工作时变化 $\pm 0.15\%F \cdot S$ 。

8 Electromagnet interference: When the radio transmitter of 20~1000MHz and 5W with 0.5 meters away from the transmitter works, it shall vary  $\pm 0.15\%F \cdot S$ .

9. 温度漂移: 温度环境每变化 $1^\circ\text{C}$ , 零点变化 $\pm 0.15\%F \cdot S$ , 量程变化 $\pm 0.01\%F \cdot S$ 。

9 Temperature drift: When the environment temperature varies by  $1^\circ\text{C}$ , the zero point varies  $\pm 0.15\%F \cdot S$  and the measurement range changes  $\pm 0.01\%F \cdot S$ .

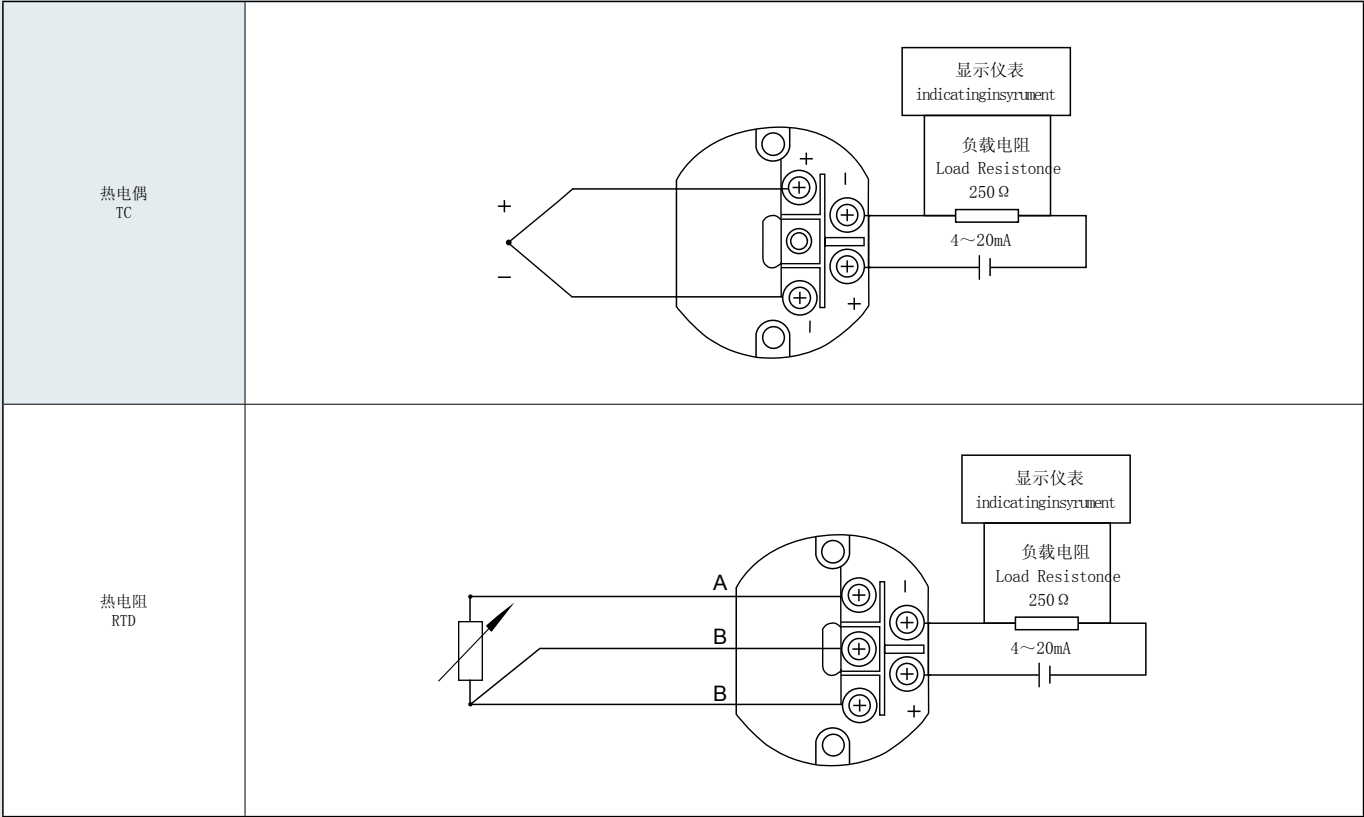
## 使用与接线Use and wiring

1:接线时应注意: 感温元件在出厂前已经联好, 并按需要调好了量程, 除有必要, 一般不能变动量程调节电位器。

1 Notice to wiring: Please note that the temperature sensor has been well connected and adjusted the measurement range before leaving factory. Please do not adjust the measurement range and potentiometer, unless it is necessary.

- 2:一体化热电偶、热电阻的安装请参阅同类型的热电偶、热电阻的产品使用说明书进行。
- 2 Please see other operating instruction manual of the same kinds for the assembling of integration thermocouple and thermal resistance.
- 3:一体化热电偶、热电阻是二线制电流输出，因此只需使用二根铜导线。接线图如下：
- 3 The integration thermocouple and thermal resistance shall use two copper conductors for they are two wire system electric output.
- 接线图如下
- Wiring diagram is as follows:

(图138 Fig 138)



订货举例Order example

订货时请写明型号、分度号、总长和置入深度，即（L×I）。

Please indicate the model, graduation mark, total length and placed depth in order, i.e. (L×I ).

例 1:WRNKB-230

Example 1:WRNKB-230 K 1150×1000

即：二线制一体化铠装热电偶，固定螺栓安装，防水式接线盒，外径Φ16mm、分度号K、总长1150、插入深度1000mm。

I.E.: Two wire system integration thermocouple, fixed bolt assembling, waterproof connection box, outer diameter Φ16mm, graduation mark K, total length 1150, placed depth 1000mm.

例 2:WZPKB-336 Pt100 L=1000

Example 2: WZPKB-336 Pt100 L=1000

即：二线制一体化铠装铂热电阻，可动卡套螺栓安装、防水接线盒、外径Φ6、分度号Pt100、总长1000mm。

I.E.: Two wire system integration sheathed platinum thermal resistance, movable ferrule bolt assembling, waterproof connection box, outer diameter Φ6, graduation mark Pt100, total length 1000mm.

# 全隔离一体化温度变送器

## Full Isolation Integrated Temperature Transmitter

通用型一体化温度变送器，用于热电阻（RTD）、热电偶、电阻和电压信号输入，通过PC可组态，安装于传感器内部。（可选带PROFIBUS-PA；HART协议）。

General integrated temperature transmitter is used for the signal input of Thermal resistance (RTD), Thermocouple (TC), Resistance and Voltage, which can be installed in the sensor through PC configuration. (PROFIBUS-PA and HART protocols are available).

### 应用场合

- PC可组态（PCP）一体化温度变送器用于将各种输入信号转换为4~20mA输出信号
- 输入
  - 热电阻（RTD）
  - 热电偶（TC）
  - 电阻（ $\Omega$ ）
  - 电压（mV）
- 通过PC，使用组态工具可进行在线组态

### Applicable places:

The PCP integrated temperature transmitter can be used to transform all kinds of input signals into 4-20mA output signals

Input

Thermal resistance (RTD)

Thermocouple (TC)

Resistance ( $\Omega$ )

Voltage (mV)

Through PC, the configuration tool can be used online.

### 特点

- 通用PC可组态型，适用于各种输入信号
- 电气隔离
- 二线制技术，4~20mA模拟量输出
- 高精度
- 传感器损坏或短路故障信号可预设，符合NAMUR NE 43
- EMC符合NAMUR NE 21, CE
- 防爆认证
- 输出模拟
- 用户可自定义测量范围

### 操作和系统结构

### Characteristics:

General PCP can be used to all kinds of input signals

Electric isolation]

Two wire system and 4-20mA analogy quality output

High accuracy

The sensor damage or short trouble back signals can be set in advance in accordance with NAMUR NE 43.

EMC shall be in accordance with NAMUR NE 21, CE.

Explosion proof certification

Output simulation

The measurement range can be customized by customers

Operating system and systematic structure

测量系统 Measurement system	智能温度变送器是二线制温度变送器，带模拟量输出，输入2-、3-、4-线制热电阻（RTD）信号、热电偶信号和电压信号，通过组态工具可进行组态。 The intelligent temperature transmitter with analog output, input 2-, 3- and 4-wire thermal resistance (RTD) signals, thermocouple signals and voltage signals can be configured through configuration tool.
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输入 热电阻（RTD） Input Thermal resistance (RTD) (表36 Table 36)

类型 Type	测量范围 Measurement Range	最小测量范围 Maximum Measurement Range
Pt100 Pt500 Pt1000 符合IEC 751 In accordance with	-200~850℃ -328~1562°F -200~250℃ -328~482°F -200~250℃ -328~482°F	10K (18°F) 10K (18°F) 10K (18°F)
Ni100 Ni500 Ni1000 符合DIN 43760	-60~180℃ -76~356°F -60~150℃ -76~302°F -60~150℃ -76~302°F	10K (18°F) 10K (18°F) 10K (18°F)
接线类型 wiring type	2-, 3-或4-连接二线制测量电缆电阻补偿 (0~20 Ω) Resistance compensation of 2-, 3-, or 4- connecting two-wire system measurement cable (0-20 Ω)	
传感器电缆电阻 Resistance of sensor cable	max. 11 Ω /每根电缆 Each cable wire	
传感器电流 Sensor current	≤0.6mA	

电阻信号（Ω）Resistance signal (表37 Table 37)

类型 Type	测量范围 Measurement Range	最小测量范围 Maximum Measurement Range
电阻（Ω） Resistance	10... 400 Ω 10... 2000 Ω	10 Ω 100 Ω

热电偶（TC）Thermocouple (TC) (表38 Table 38)

类型 Type	测量范围 Measurement Range	最小测量范围 Maximum Measurement Range
B (PtRh30-PtRh6) C (W5Re-W26Re) <sup>[3]</sup> D (W3Re-W25Re) <sup>[3]</sup> E (NiCr-CuNi) J (Fe-CuNi) K (NiCr-Ni) L (Fe-CuNi) <sup>[2]</sup> N (NiCrSi-NiSi) R (PtRh13-Pt) S (PtRh10-Pt) T (Cu-CuNi) U (Cu-CuNi) <sup>[2]</sup> MoRe5-MoRe41 <sup>[1]</sup> 符合IEC 584 Part 1 In accordance with	0~+1820℃ 32~3308°F 0~+2320℃ 32~4208°F 0~+2495℃ 32~4523°F -200~+915℃ -328~1679°F -200~+1200℃ -328~2192°F -200~+1372℃ -328~2501°F -200~+900℃ -328~1652°F -270~+1300℃ -454~2372°F 0~+1768℃ 32~3214°F 0~+1768℃ 32~3214°F -200~+400℃ -328~752°F -200~+600℃ -328~1112°F 0~+2000℃ 32~3632°F	500K (900°F) 500K (900°F) 500K (900°F) 50K (900°F) 50K (900°F) 50K (900°F) 50K (900°F) 50K (900°F) 50K (900°F) 500K (900°F) 500K (900°F) 50K (900°F) 50K (900°F) 500K (900°F)
冷端 Cold junction	内部 (Pt100) 或外部 (0...80℃), 32...176°F Inner (Pt100) or Outer (0...80℃), 32...176°F	
冷端精度 Accuracy of cold junction	±1K	
传感器电流 Sensor current	30nA	

电压信号（mV）Voltage signal (mV) (表39 Table 39)

类型 Type	测量范围 Measurement Range	最小测量范围 Maximum Measurement Range
毫伏（mV） Millivolt (mV)	-10... 100mV	5mV

输出 输出 (模拟量) Input Output (analog quantity)

(表40 Table 40)

输出信号 Input signal	4...20 mA, 20...4 mA
传输特性 Transmit characteristics	温度线性, 电阻线性, 电压线性 Temperature, resistance and voltage linearity
最大负载 Maximum load	( $V_{\text{电源}} - 8V$ ) / 0.025A

- (1) 无参考  
(2) 符合DIN 43710  
(3) 符合ASTM E988  
(1) Without reference  
(2) In accordance with DIN 43710  
(3) In accordance with ASTM E988

数字过滤器第1级 Digital filter Grade 1	0...8 s
输入电流 Input current	$\leq 3.5$ mA
电流限制 Current limitation	$\leq 25$ mA
延时开关 Time delay switch	4 s (在上电过程中 $I_a=3.8$ mA) 4 s (During power on $I_a=3.8$ mA)
响应时间 Response time	1 s

故障信号 (故障监测) Trouble back (fault) signal (fault monitoring)

(表41 Table 41)

低于测量下限 Lower than measurement lower limit	输出降至3.8 mA Output down to 3.8 mA
超过测量上限 Beyond measurement upper limit	输出升至20.5 mA Output up to 20.5 mA
传感器损坏 Sensor damage 传感器短路 <sup>(1)</sup> Sensor short circuit	可设置为 $\leq 3.6$ mA或 $\geq 21.0$ mA Can be set as $\leq 3.6$ mA or $\geq 21.0$ mA

电气连接Electric connection

(表42 Table 42)

电源 Power supply	$U_b=8...35$ V DC, 极性保护 Polarity protection
电气隔离 (输入/ 输出) Electric isolation (Input/Output)	$U=3.75$ kV AC
允许波动范围 Allowable vibration range	$U_{is} \leq 5V$ (当 $U_b \geq 13V$ , $f_{max}=1$ kHz时)

精度 Accuracy

(表43 Table 43)

参考条件 Reference condition	标定温度23°C (73.4°F) $\pm 5K$ Labeled temperature 23°C (73.4°F) $\pm 5K$
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热电阻 (RTD) Thermal resistance (RTD)

(表44 Table 44)

类型Type	测量精度 <sup>(2)</sup> Measurement accuracy
Pt100, Ni100	0.2 K或0.08%
Pt500, Ni500	0.5 K或0.20%
Pt1000, Ni1000	0.3 K或0.12%

## 电阻信号 (Ω) Resistance signal

(表45 Table 45)

类型Type	测量精度 <sup>[2]</sup> Measurement accuracy	测量范围Measurement range
电阻 (Ω) Resistance	±0.1 Ω 或 0.08%	10...40 Ω
	±1.5 Ω 或 0.12%	10...2000 Ω

## 热电偶 (TC) Thermocouple (TC)

(表46 Table 46)

类型 Type	测量精度 <sup>[2]</sup> Measurement accuracy
K, J, T, E, L, U N, C, D S, B, R MoRe5-MoRe41	typ. 0.5 K 或 0.08% typ. 1.0 K 或 0.08% typ. 2.0 K 或 0.08%
内部参考端影响 Affected by internal reference end	pt100 DIN IEC 751 Cl.B

## 电压信号 (mV) Voltage signal (mV)

(表47 Table 47)

类型 Type	测量精度 <sup>[2]</sup> Measurement accuracy	测量范围Measurement range
毫伏 (mV) Millivolt (mV)	±20 μV 或 0.08% ±20 μV or 0.08%	-10...10 mV
电源影响 Affected by power supply	≤±0.01%/V 偏离24V <sup>[3]</sup> ≤±0.01%/V with deviation of 24V <sup>[3]</sup>	测量范围Measurement range
负载影响 Affected by load	≤±0.02%/100 Ω <sup>[3]</sup>	-10...10 mV

(1) 不适用于热电偶

(2) %相对于可调测量范围 (取大值)

(3) 所有数据与20 mA时的测量终值 (FSD) 有关

(1) Not applicable to thermocouple.

(2) Select the maximum value % for adjustable measurement range

(3) All data are related to the final value of measurement (FSD)

温度漂移 Temperature shift	热电阻 (RTD) Temperature shift Td=± (15 ppm/K*最大测量范围) ±50 ppm/K*预设测量范围) *Δθ 热电阻Pt100: Td=± (15 ppm/K*Maximum measurement range) ±50 ppm/K*Measurement range set in advance) *Δθ Thermal resistance Pt100: Td=± (15 ppm/K* (测量终值+200) +50ppm/k*预设测量范围) *Δθ 热电偶 (TC): Td=± (15 ppm/K* (Final value of measurement+200) +50ppm/k*Measurement range set in advance) *Δθ Thermocouple (TC): Td=± (50 ppm/K*最大测量范围+50ppm/k*预设测量范围) *Δθ Δθ=环境温度对参考温度的偏离值 Td=± (50 ppm/K*Maximum measurement range+50ppm/k*Measurement range set in advance) *Δθ Δθ=Stray value between environment temperature and reference temperatur
长期稳定性 long-term stability	≤0.1K/年 <sup>[1]</sup> 或≤0.05%/年 <sup>[1][2]</sup> ≤0.1K/Year <sup>[1]</sup> or ≤0.05%/Year <sup>[1][2]</sup>

## 安装条件Installation condition

(表48 Table 48)

安装角度Installation angle	无限制No limitation
安装区域Installation area	防水接线盒或隔补接线盒Waterproof connecting box or isolation connecting box

## 应用条件 环境条件Application condition

## Environment condition

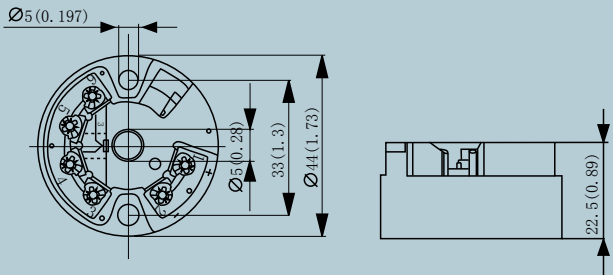
(表49 Table 49)

环境温度 Environment temperature	-40...+85℃ (-40...185°F), 用于防爆区域 -40...+85℃ (-40...185°F), Applicable to explosion proof area
贮存温度 Storage temperature	-40...+100℃ (-40...212°F)
气候等级 Climate grade	符合EN 60654-1, Class C In accordance with EN 60654-1, Class C
冷凝 Condensation	允许Permission
防护等级 Degree of protection	IP 00/ IP 66安装 IP 00/ IP 66 Installation
震动保护 Shock protection	4g / 2...150Hz, 符合IEC 60068-2-6
电磁兼容性 Electromagnetic compatibility	抗干扰和干扰辐射符合EN 61326-1和NAMUR NE 21 Anti-interference and anti-interference radiation in accordance with EN 61326-1 and NAMUR NE 21



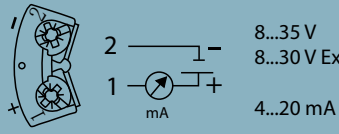
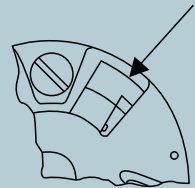
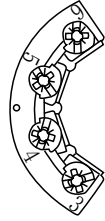
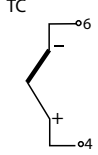
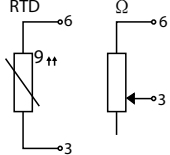
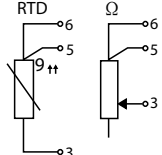
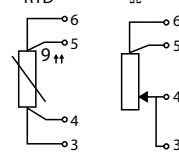
机械结构 Mechanical mechanism

(图139 Fig 139)

尺寸Dimension	
重量Weight	≈40 g
材质Material	外壳: PC, Potting: PUR case: PC, Potting: PUR
端子Terminal	电缆max. 1.75 mm <sup>2</sup> (0.0027 in <sup>2</sup> ) cable max. 1.75 mm <sup>2</sup> (0.0027 in <sup>2</sup> )

端子接线Wire connection of terminal

(图140 Fig 140)

<p>电源和电流输Power supply and electricity</p> 		<p>设定端Set end</p> 		
传感器接线Sensor wiring	TC	2线 2 wire	3线 3 wire	4线 4 wire
				

- (1) 符合参考条件 In accordance with the reference conditions.  
 (2) %相对于可调测量范围 (取大值) Select the maximum value % for adjustable measurement range

显示和操作系统 远程操作 Display and operating system Remote operation

(表50 Table 50)

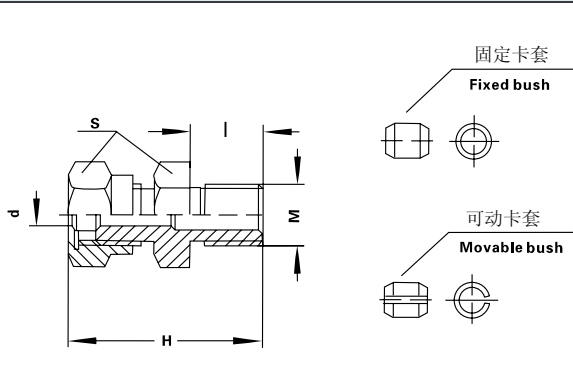
组态工具 Configuration tool	特定组态工具Special configuration tool
组态软件 Configuration software	PC操作软件 (ReadWin®2000) PC operating software (ReadWinR2000)
接口 Interface	PC接口连接电缆TTL-/RS 232带插头 TTL-/RS 232 connecting cable with plug for PC
可组态参数 Configuration parameter	传感器类型和连接方式、工程单位 (°C/°F), 测量范围、内部/外部冷端补偿, 二线制测量时的电缆电阻补偿, 故障条件, 输出信号 (4...20/20...4 mA), 数字过滤器 (阻尼), 偏置, 测量点标识 (8字符), 输出模拟 Sensor type and connecting type and engineering unit (°C/°F), measurement range, internal/external cold junction compensation, cable resistance compensation in two wire system measurement, fault condition, output signal (4...20/20...4 mA), digital filter(damp), offset, measuring point mark(8 character) and output analog.

# 热电偶热电阻用配件

## Accessories of thermocouple and thermal resistance

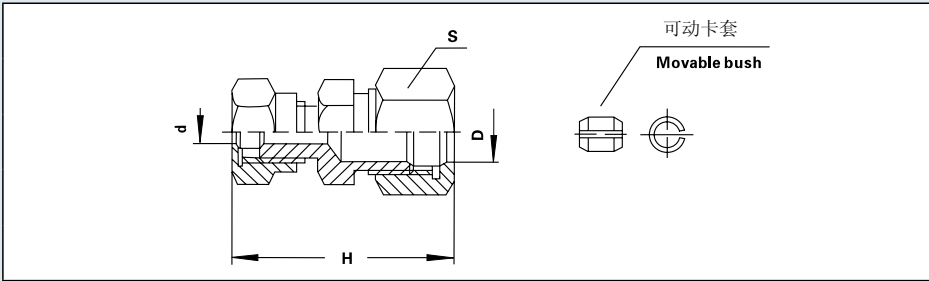
卡套螺栓 Ferrule bolt

(图141 Fig 141)

	d		Φ 2	Φ 3	Φ 4	Φ 5	Φ 6	Φ 8
	基本参数 Basic parameter							
	M		M12×1.5			M16×1.5		
	S		19			22		
	H		≈42			≈42		
	公称压力 Nominal pressure	固定卡套 Fixed ferrule	2.5MPa					
可动卡套 Movable ferrule		常压 Normal pressure						

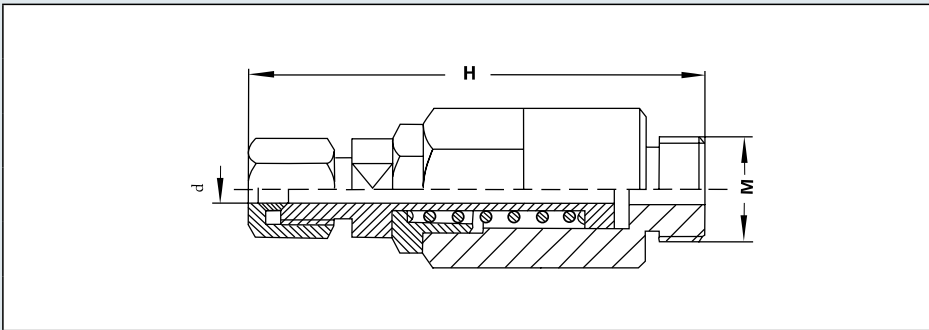
可动卡套活接头 Movable ferrule joint

(图142 Fig 142)

		S	D	d	H
		24	Φ12	Φ3 Φ4 Φ5 Φ6 Φ8	≈50
			Φ16		
		30	Φ20		
		33	Φ22		

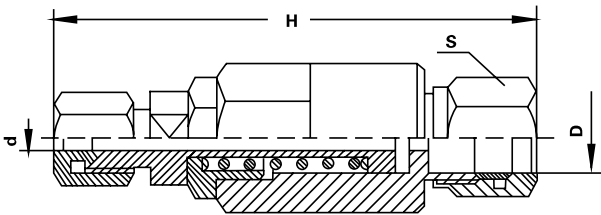
防震阻漏弹性螺栓 Antihunting and leaking proof spring bolt

(图143 Fig 143)

		d	M	H
		Φ3 Φ4 Φ5 Φ6 Φ8	M16×1.5	≈80
			M18×1.5	
			M20×1.5	
			G1/2"	
			G3/4"	

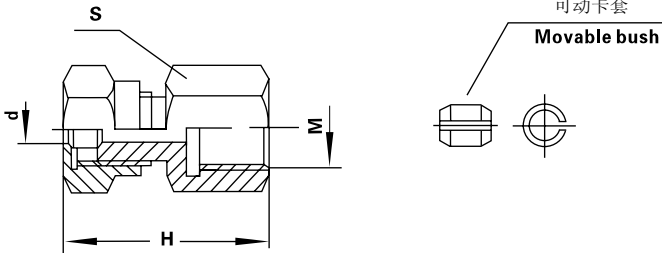
防震弹性活接头Antihunting spring joint

(图144 Fig 144)

	D	d	S	H
	Φ 12	Φ 2 Φ 3 Φ 4 Φ 5 Φ 6 Φ 8	24	≈90
	Φ 16			
	Φ 20		30	
	Φ 22		33	

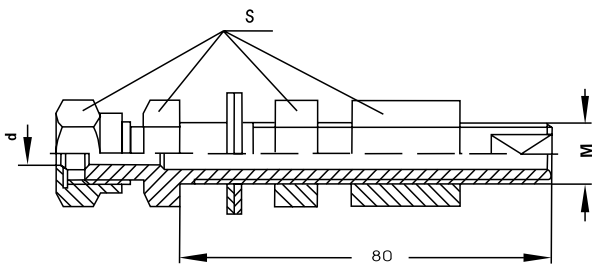
内螺栓卡套转换接头Internal bolt ferrule adapter

(图145 Fig 145)

	M	S	d	H
	M12×1	22	Φ 3 Φ 4 Φ 5 Φ 6 Φ 8	≈38
	M16×1			
	M22×1	27		
	G1/2"	25		
	G3/4"	36		
	G1"	40		

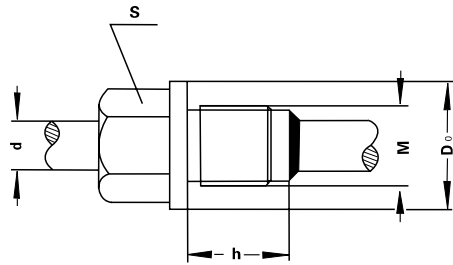
汽缸长卡套螺栓Cylinder long ferrule bolt

(图146 Fig 146)

	d	M	S	公称压力 Nominal pressure
	Φ 3	M16×1.5	22	2.5 Mpa
	Φ 4			
	Φ 5			
	Φ 6			

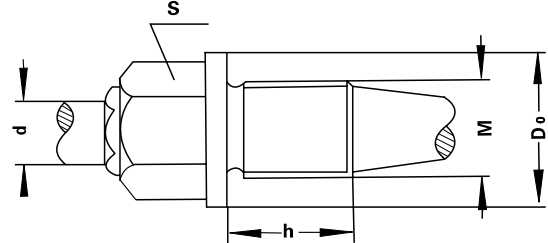
直形保护管固定螺栓Straight lined protection tube fixed bolt

(图147 Fig 147)

	d	M	h	s	D0	公称压力 Nominal pressure
	Φ 10	M27×2 G3/4"	32	32	Φ 40	10 Mpa
	Φ 12					
	Φ 16					
	Φ 20	M33×2 G1"	35	36	Φ 48	

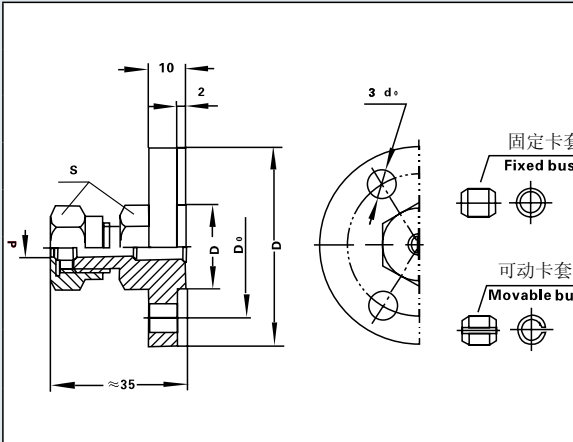
锥形保护管固定螺栓Taper protection tube fixed bolt

(图148 Fig 148)

	M	h	s	D0	公称压力 Nominal pressure
	M33×2	33	36	Φ48	10 Mpa
	G1"				
	1-11.5NPT				

卡套法兰Ferrule flange

(图149 Fig 149)

	d	φ 2	φ 3	φ 4	φ 5	φ 6	φ 8	
	基本参数 Basic parameter							
	D	φ 50			φ 60			
	D <sub>0</sub>	φ 36			φ 42			
	D <sub>1</sub>	φ 20			φ 24			
	d	φ 7			φ 9			
	S	φ 19			φ 22			
	固定卡套 Fixed ferrule	2.5MPa						
可动卡套 Movable ferrule	常压 Normal pressure							

固定法兰Fixed flange

(图150 Fig 150)

d	D	D1	d1	H	d0	公称压力 Nominal pressure
Φ8 Φ10	Φ95	Φ65	Φ45	16	Φ14	2.5 Mpa
Φ12 Φ16	Φ105	Φ75	Φ55			
Φ20 Φ22 Φ25	Φ115	Φ85	Φ65	18		

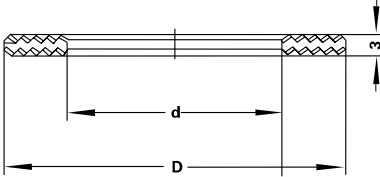
活动法兰Flexible flange

(图151 Fig 151)

d	D	D1	d0	公称压力 Nominal pressure
Φ10 Φ12 Φ16 Φ20 Φ22 Φ25	Φ70	Φ54	Φ6	常压 Normal pressure

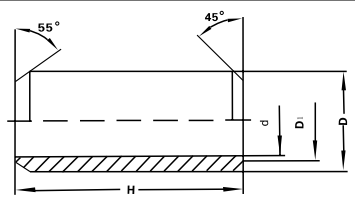
齿形垫片 (不锈钢) Serrated washer (stainless steel)

(图152 Fig 152)

	d	D	齿条数 Number of Rack
	Φ 16	Φ 25	2
	Φ 27	Φ 40	6
	Φ 20	Φ 48	7

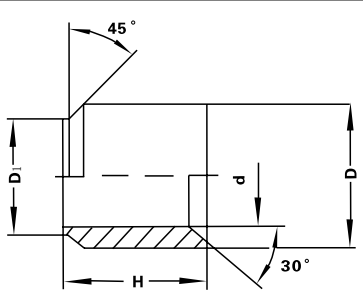
01型管座 01 type valve holder

(图153 Fig 153)

	材料 Material	d	D	D1	H
	1Cr18Ni9Ti 12Cr1Mov	Φ 44	Φ 62	Φ 46	130

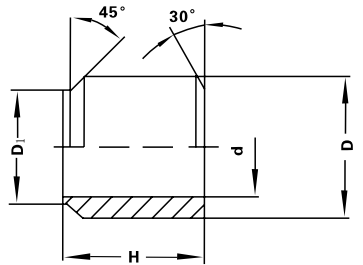
13型管座 13 type valve holder

(图154 Fig 154)

	材料 Material	d	D	D1	H
	1Cr18Ni9Ti 12Cr1Mov	Φ 38	Φ 58	Φ 42	40

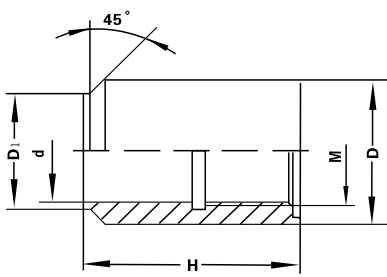
14型管座 14 type valve holder

(图155 Fig 155)

	材料 Material	d	D	D1	H
	1Cr18Ni9Ti 12Cr1Mov	Φ 33	Φ 53	Φ 37	40

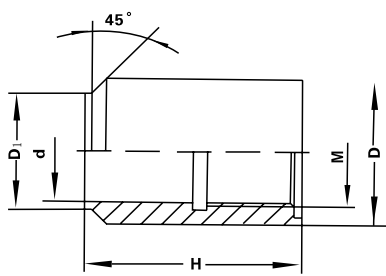
B 型管座 (用于配齿形垫片) B type valve holder (used with tooth serrated washer)

(图156 Fig 156)

	材料	Material	M	d	D	D1	H
	1Cr18Ni9Ti 12Cr1Mov	M27×2	Φ 24	Φ 45	Φ 28	65	
		G3/4"					
		M33×2	Φ 30	Φ 54	Φ 34		
		G <sub>1</sub> "					

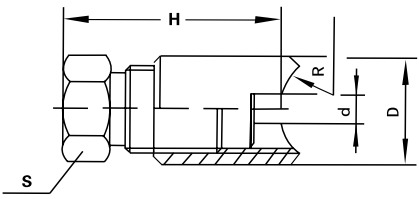
V 型管座（用于配紫铜垫片）V-type valve holder ( used with red copper washer)

(图157 Fig 157)

	材料	Material	M	d	D	D1	H
	1Cr18Ni9Ti 12Cr1Mov	M27×2	Φ 24	Φ 45	Φ 28	65	
		G3/4"					
		M33×2	Φ 30	Φ 54	Φ 34		
		G <sub>1</sub> "					

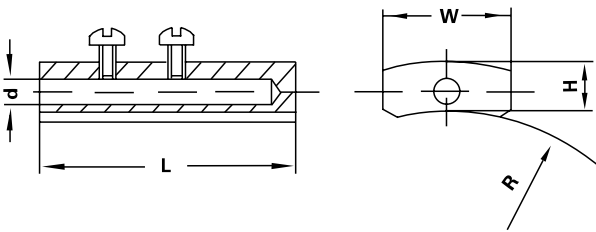
旋压式取热座Spinning heat collecting seat

(图158 Fig 158)

	d	D	S	H	R
	Φ 4 Φ 5 Φ 6	22	19	45	弧度根据被测管道的 曲率半径而定 The radian is determined by the radius of curvature

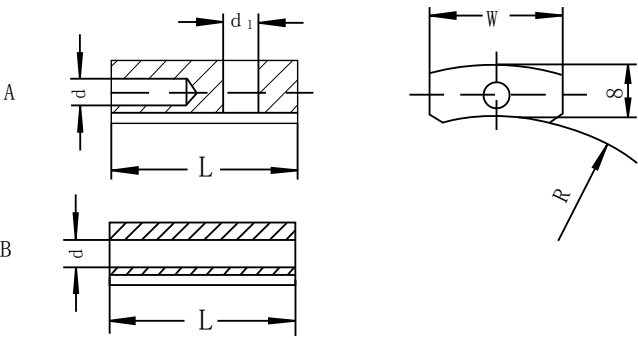
螺钉固定式集热板Bolt-fixed heat collecting plate

(图159 Fig 159)

	d	W	L	H	R
	Φ 4 Φ 5 Φ 6	20	40	8	弧度根据被测管道的 曲率半径而定 The radian is determined by the radius of curvature

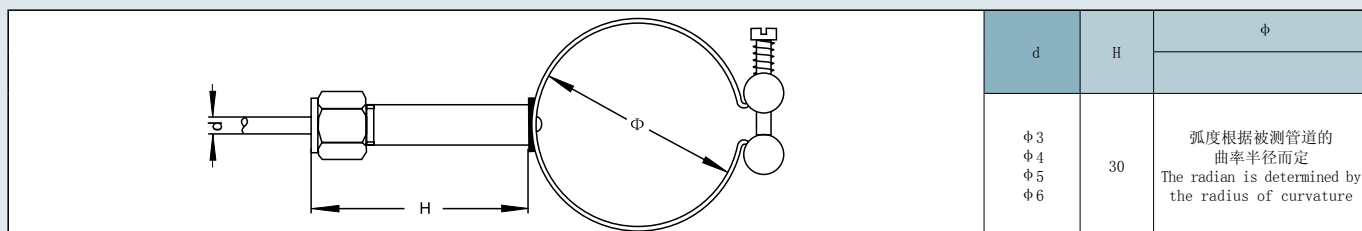
焊接固定式集热板Welded fixed heat collecting plate

(图160 Fig 160)

	d	d1	W	L	R
	Φ 4 Φ 5 Φ 6	Φ 5.5 Φ 8.5	20	25	弧度根据被测管道的 曲率半径而定 The radian is determined by the radius of curvature

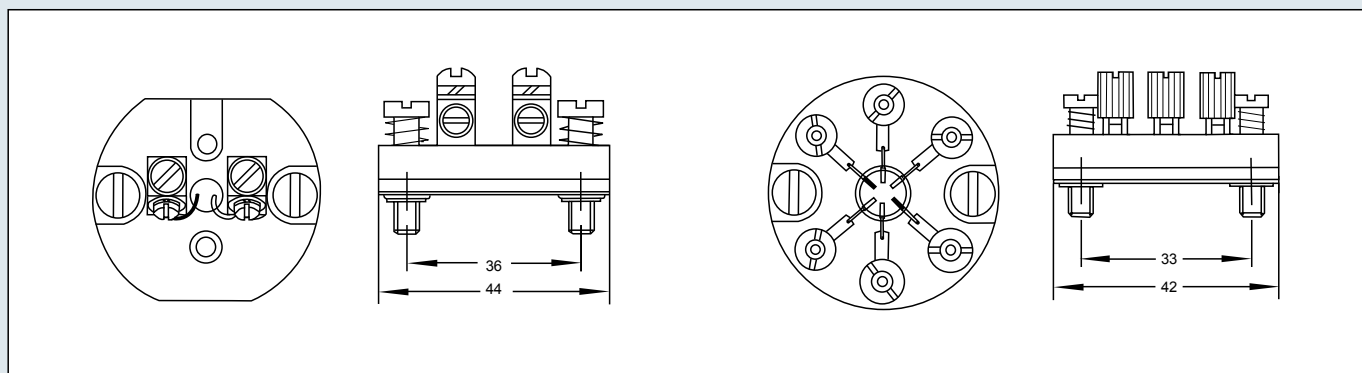
抱箍 Anchor ear

(图161 Fig 161)



接线端子 Connection terminal

(图162 Fig 162)



接线板 Terminal block

(图163 Fig 163)

外形尺寸图 Outline dimensional drawing								
	40		40		40		40	
类型 Type	接线板 (2线端) Terminal block (2-terminal)		接线板 (3线端) Terminal block (3-terminal)		接线板 (4线端) Terminal block (4-terminal)		接线板 (6线端) Terminal block (6-terminal)	
材料 Material	树脂 Resin	陶瓷 Porcelain	树脂 Resin	陶瓷 Porcelain	树脂 Resin	陶瓷 Porcelain	树脂 Resin	陶瓷 Porcelain
接线端子数 Wiring terminal number	2P	2P	3P	3P	4P	4P	6P	6P

接线板 Terminal block

(图164 Fig 164)

外形尺寸图 Outline dimensional drawing								
	33 Φ 42		33 Φ 42		33 Φ 42		33 Φ 42	
类型 Type	接线板 (2线端) Terminal block (2-terminal)		接线板 (3线端) Terminal block (3-terminal)		接线板 (4线端) Terminal block (4-terminal)		接线板 (6线端) Terminal block (6-terminal)	
材料 Material	树脂 Resin	陶瓷 Porcelain	树脂 Resin	陶瓷 Porcelain	树脂 Resin	陶瓷 Porcelain	树脂 Resin	陶瓷 Porcelain
接线端子数 Wiring terminal number	2P	2P	3P	3P	4P	4P	6P	6P



I型防水式接线盒 I type waterproof connection box

(图165 Fig 165)

The diagram illustrates a cross-section of a dome-shaped waterproof connection box. Key dimensions and components are labeled as follows:

- W**: Width of the top dome section.
- H**: Total height of the assembly from the base to the top of the dome.
- d**: Diameter of the base mounting flange.
- d1**: Diameter of the central terminal hole.
- M**: Thread specification for the central terminal (e.g., M20x1.5).

The assembly includes a base flange, a central terminal with a nut and washer, and a dome-shaped top with a gasket for waterproofing.

d	M	d1	W	H
Φ 45	M20×1.5	Φ 15	≈57	≈90
材料 Material	F0240		Al	
	F0241		1Cr18Ni9Ti	

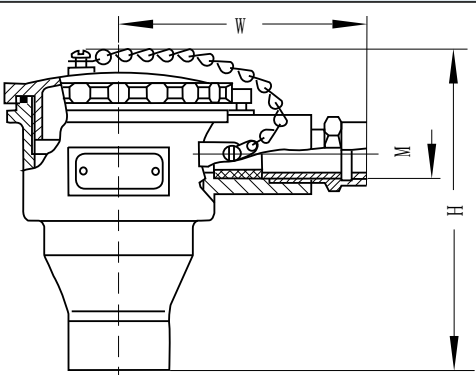
II型防水式接线盒 II type waterproof connection box

(图166 Fig 166)

	M1	M	d1	W	H
	M12×1 M16×1 M22×1 G1/2"	M20×1.5	Φ 15	≈ 59	≈ 95
	材料 Material		F0250		AI
			F0251		1Cr18Ni9Ti

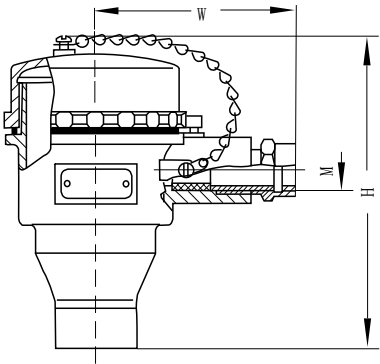
隔爆接线盒 (dIIBT4) Explosion-proof connection box (dIIBT4)

(图167 Fig 167)

	M	W	H
	M20×1.5 G1/2" or G3/4"	≈95	≈120
	材料 Material	F0260	AI
		f0261	1Cr18Ni9Ti

隔爆接线盒 (dIICT5) Explosion-proof connection box (dIICT5)

(图168 Fig 168)

	M	W	H
	M20×1.5 G1/2" or G3/4"	≈95	≈140
	材料 Material	F0270	AI
		f0271	1Cr18Ni9Ti